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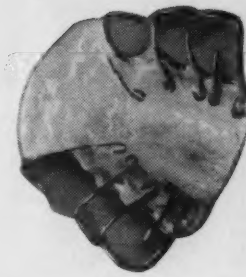


IV


Preformed Anterior Bands
Contoured Cuspid Bands
Contoured Bicuspid Bands
Contoured Molar Bands

American Journal

of

ORTHODONTICS

VOL. 45 MAY, 1959 No. 5

Original Articles

ORTHODONTIC TREATMENT FACTORS IN CLASS II MALOCCLUSION

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INTRODUCTION

SINCE the Class II malocclusion was defined by Angle,[1] discussion of it has occupied a prominent place in orthodontic literature. There has been little disagreement as to what constitutes the dental morphology of a Class II malocclusion; however, numerous concepts have been proposed concerning its etiology and orthodontic treatment. Out of these conflicting concepts arose divergent schools or philosophies based upon treatment procedures. Each of the various groups adopted the particular concept that supported its own view. These conflicting points of view did much to divide the orthodontic profession in its early history.

Two of the divergent concepts have survived to the present day, and Strang[2] has summarized them as follows:

> One group of orthodontists teaches that the teeth in both jaws should first be correctly aligned in their proper arch form and then the patient should be trained to bite forward until correct inclined

This thesis, which was given as a partial fulfillment of the requirements for certification by the American Board of Orthodontics, is being published with the consent and the recommendation of the Board but it should be understood that it does not necessarily represent or express the opinion of the Board.

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plane relationship is obtained, after which he should continue to exercise and masticate with the mandible in this position. They affirm that this will eventually establish, as a fixed condition, the normal relationship of the mandibular dental arch with cranial anatomy. The other group believes that it is hopeless to try to obtain a permanent forward position of the mandible by shifting the condyles onto the articulating eminences anterior to the mandibular fossae, for they will always slide back into the fossae when the patient is not exerting a voluntary effort to maintain their false position. So, instead of doing this, they teach that the operator should establish stationary anchorage primarily in the mandibular denture and then move the maxillary teeth distally until normal inclined plane relationship of the dental units is obtained, even though a temporary deformity is produced.

Proponents of these two opposing philosophies advance them to justify the particular type of mechanical therapy that they advocate. Since the philosophies are diametrically opposite, we would expect the mechanical forces that the two groups advocate to be opposite also. Amazingly enough, when an analysis is made of the various types of appliances advocated by each group, it is found that the directions of force applied to the dentures are essentially the same in all cases. It is further found that both groups can exhibit records of successfully treated Class II malocclusions. It appears, therefore, that the only controversy that still exists in orthodontic circles is over what occurs during treatment in the successfully treated Class II malocclusion.

This article was not written in support of any dogma or so-called philosophy. Rather, it was written in an effort to ascertain whether a logical concept of what occurs during treatment could be evolved from known facts and from more recent unreported studies. The successful attainment of this objective would do much to clarify the clinician's thinking concerning the aims of orthodontic treatment. The present study was undertaken in order to determine what occurs during the orthodontic treatment of Class II malocclusion and to reanalyze the conflicting philosophies in light of the findings.

FACTORS INFLUENCING TREATMENT RESULTS

In the past, several studies have been made of the factors concerned in the treatment of malocclusion. Brodie, Downs, Goldstein, and Myer[3] were the first to utilize roentgenographic cephalometry for such a study. This technique has now been universally accepted as the most accurate means for analyzing the results of orthodontic treatment. The results of the present study are based upon this method of analysis.

Two factors obviously are of primary importance in the successful treatment of the Class II malocclusion. These factors are growth and mechanical therapy. This certainly is not a new concept; yet, there has been a great deal of controversy over the relative importance of each of these factors, as well as

over the mode of their operation. Basically, the problem confronting the orthodontist with respect to the Class II malocclusion is the correction of the posterior relationship of the mandibular denture to the maxillary denture. When this basic premise is accepted, a hypothesis can be formulated by postulating all the various possible factors that might be associated with the orthodontic correction of the Class II malocclusion. Before commencing this study, I devised such a hypothesis so that all the possible factors could be thoroughly evaluated. Each of the factors, alone or in combination, could account for the successful result of orthodontic treatment. The possible factors that could be associated with the maxilla are as follows:

1. Inhibit the normal forward growth of the maxilla.
2. Inhibit the normal forward movement of the maxillary denture.
3. Control or alter the normal eruption pattern of the maxillary teeth.
4. Move the maxillary denture posteriorly.
5. Create spaces in which to move teeth by selective extractions.

In the mandible the possible factors that could be associated with the successful correction of a Class II malocclusion are as follows:

1. Stimulate horizontal and vertical growth of the mandible.
2. Control or alter the normal eruption pattern of the mandibular teeth.
3. Move the mandibular denture forward upon its skeletal base.
4. Reposition the mandibular body anteriorly.
5. Create space in which to move teeth by selective extractions.

All of the foregoing factors can be adequately evaluated by the roentgenographic cephalometric technique with the exception of the first of the factors associated with the mandible. The question of whether or not orthodontic therapy stimulates mandibular growth must remain unanswered, at least for the present. The effect of growth upon the treatment results, however, can still be evaluated. Therefore, a word should be said concerning the normal growth process, so that the findings can be evaluated with this in mind.

Constancy of the Facial Growth Pattern.—First Broadbent[4] and then Brodie,[5] by different approaches, pointed out what has been termed "the constancy of the facial pattern" during the growth process from birth to adulthood (Fig. 1). Their findings were based upon averages drawn from a serial longitudinal study of a number of persons. Neither author reported the individual variations that were observed in the persons who comprised the studies. Many have interpreted Broadbent's and Brodie's findings to mean that the growth of the face is a proportionate enlargement with all skeletal points maintaining a constant relationship to each other. In the light of more recent studies upon maturation changes and sex differences in the facial pattern[6-8] and studies of individual patients, the generally accepted interpretation of the constancy of the facial pattern must be modified.

When the facial growth patterns of individuals are studied, variation rather than constancy is the rule. One should be aware not only of the variations that occur between the facial forms of different persons but also of the variations that can and do occur in the development of the facial forms of individuals during their growth period. The angular relationship between the various parts of the face of the same person will be altered by growth, and as yet such changes cannot be predicted in advance.

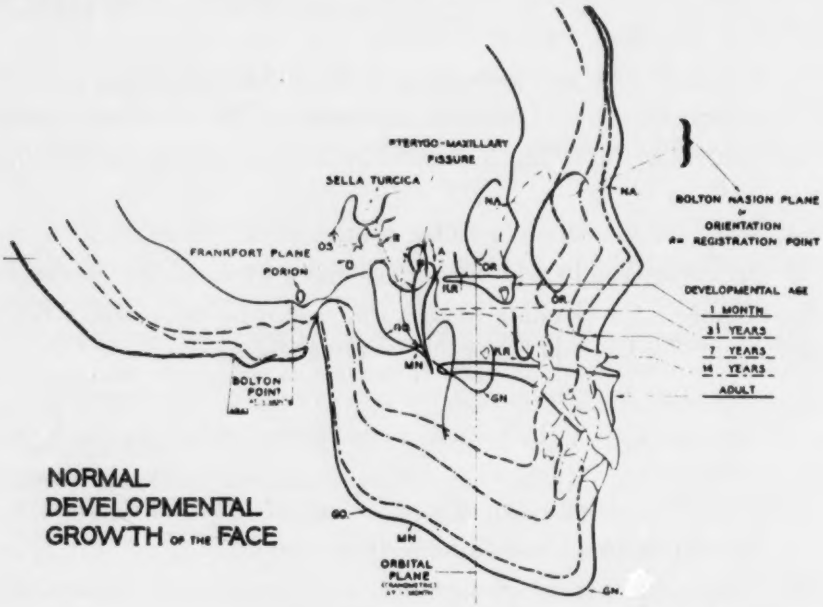


Fig. 1.—Constancy of the facial growth pattern. (From Broadbent: *Angle Orthodontist* 7: 4, 1937.)

When the facial growth pattern of individuals is viewed in general, without benefit of measurement or connecting lines, it may be noted that the general conformation of the face tends to remain the same. A severely retrognathic face in childhood invariably develops into a retrognathic type of adult face. Likewise, the person who has a prognathic profile in childhood most surely will have a prognathic profile in adulthood.

Quite often it has been observed on serial records of the same person that the face may be retrognathic in early childhood but may become more mesognathic as the child enters adolescence. An untreated Class II malocclusion in a retrognathic face will remain in Class II tooth relationship, however, even though the face becomes more mesognathic. This type could well be classified as a maxillary dental protrusion. Clinically, the orthodontist can substantiate this observation by the fact that he has never observed a true Class II or Class III malocclusion correct itself without orthodontic intervention.

It has been found that the general conformation of the face does not vary much throughout the growth period in persons who suffer prenatal disturbances

to growth sites but from which they recover prenatally. Brodie[9] has illustrated this well in his paper entitled "Behavior of Normal and Abnormal Facial Growth Patterns" (Fig. 2).

The concept of the constancy of the facial pattern can be accepted only if our thinking is restricted to the general conformation of the average face and is not applied to the individual. Accepting this more liberal interpretation, one is in a position to evaluate more accurately the findings to be presented.

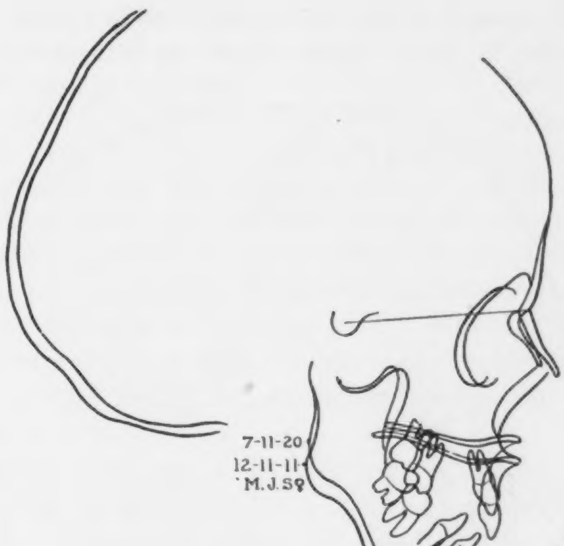


Fig. 2.—Warped facial pattern showing constancy of the pattern during growth between 7 and 12 years of age. (From Brodie: Am. J. Orthodontics & Oral Surg. 27: 633-647, 1941.)

Sex and Maturation Factors.—The effects of maturation upon the bony facial profile and the differences between the sexes with respect to such changes should be kept in mind when one is studying the effects of orthodontic treatment. In cross-sectional[7, 8] and serial studies,[10] it has been shown that the female facial pattern, on the average, undergoes maturation changes sometime between the ages of 11 and 13 years. These changes can be described generally as a flattening or decrease in the convexity of the facial profile as well as an uprighting of the incisors or a decrease in the protrusiveness of the anterior part of the denture. These same changes were observed in the male face several years later and were much more marked than in the female face. In other words, the female adult face has more convexity and a more protrusive denture than the male adult face. Boys, on the average, at 13 years of age still have a significantly active growth period ahead of them, while at this age girls are reaching the end of their active growth cycle.

These findings have been substantiated by Barnes[10] in a serial study of a group of boys and girls growing between the ages of 12 and 15 years (Table

TABLE I. SERIAL STUDY OF MAXILLARY AND MANDIBULAR GROWTH BETWEEN THE AGES OF 12 AND 15 YEARS

SUBJECTS AND NUMBER	MAXILLA (MM.)			MANDIBLE (MM.)		
	12 YRS.	15 YRS.	NET GROWTH	12 YRS.	15 YRS.	NET GROWTH
Males (16)	83.96	87.77	3.81	101.50	109.21	7.71
Females (18)	80.08	81.91	1.83	98.55	102.52	3.97

I). It is quite evident that in the three-year growth period the boys grew exactly twice as much in actual linear length of both the maxilla and the

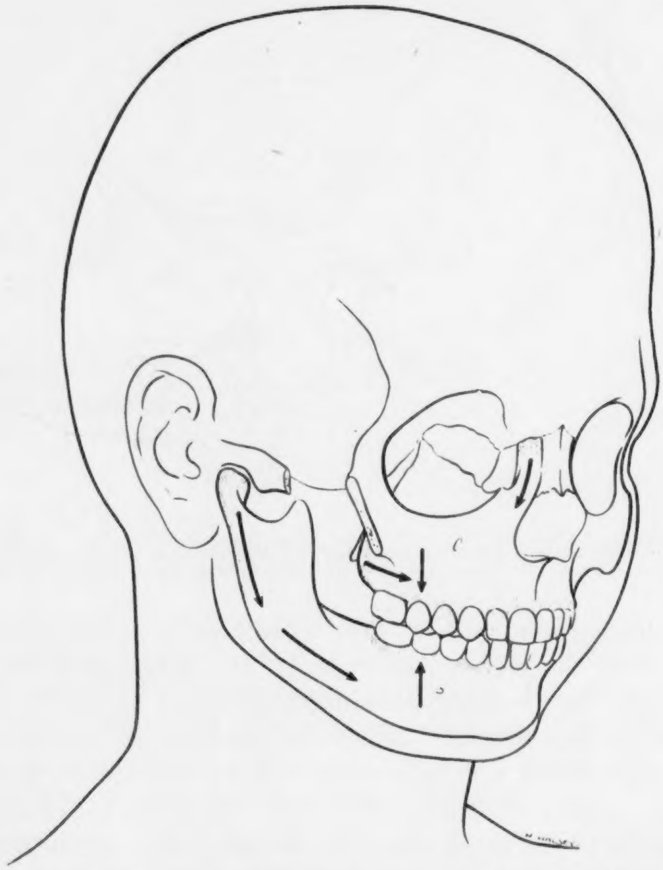


Fig. 3.—Primary growth sites of the maxilla and mandible. Shaded areas indicate the sites described in the text. Arrows indicate the direction of growth resulting from growth at these sites.

mandible as did the girls. These findings are very important to the orthodontist in that, if he desires to take advantage of the influence which growth might have upon orthodontic treatment, it is necessary to treat girls at an earlier age than boys.

Facial Growth Sites.—The methods of evaluating serial cephalometric headfilms are based upon a knowledge of facial growth sites. A brief review

of these growth sites is presented in that it is necessary for an understanding of their influence upon the developing facial pattern. When facial growth is studied in relation to the cranial base, it is found that there are six growth sites of prime importance to the development of the face (Fig. 3). Three of these sites are located within the maxilla proper, and three are found within the mandible itself. Thus, these growth sites are intimately associated with the growth and development of the area that is being discussed.

The maxillary growth sites are responsible for the downward and forward development of the upper and middle parts of the face. One of these areas is the tip of the frontal process of the maxilla where it meets the cranial base, causing a downward positioning of the maxilla in relation to cranial landmarks. There is continual growth of the alveolar process, as well as eruption of the maxillary denture in a downward direction, during the active growing period until the adult size of the face is attained. A third maxillary growth site is located at the tuberosity, posterior to each side of the maxillary denture. The growth in the tuberosity region is responsible for the forward positioning of the maxillary denture during the growth process as well as for the accommodation of the subsequent eruption of the second and third permanent molars. These three growth sites, therefore, are responsible for the normal downward and forward positioning of the maxillary denture during the process of normal facial growth.

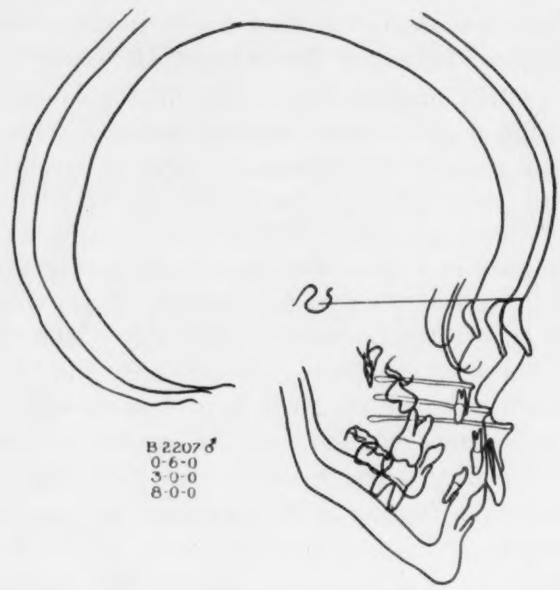
In the mandible, the three primary growth sites are located upon the posterior border of the ramus, the head of the mandibular condyle, and the crest of the alveolar process which is associated with the eruption of the mandibular teeth. The growth at the posterior border of the ramus and at the head of the mandibular condyle results in both a downward and a forward positioning of the mandibular denture during the active growth period. The growth of alveolar bone and the eruption of teeth add to the vertical development of the lower part of the face, and they normally keep pace with the vertical growth of the mandibular ramus occurring at the mandibular condyle. There are, of course, several other growth sites located within the face; these may be classified primarily as adjustment areas maintaining normal positional relationships and are not of prime importance in the present discussion.

Method of Evaluation.—First, before the results of this study are reported, the method of evaluation should be thoroughly explained and understood. The full-profile tracings of the cases, before and after orthodontic treatment, were superimposed on a line drawn from the center of sella turcica *(S)* to nasion with *S* registered. This method of superimpositioning permits an overall evaluation of the treatment result and the effects of growth. Fig. 4 illustrates this method of superimpositioning. It may be noted that the general conformation of the face has remained essentially the same between the various ages illustrated.

In order to evaluate what has occurred within the maxilla and the mandible, other methods of superimpositioning must be employed. In evaluating

maxillary changes, it has been the accepted practice in the past to superimpose the before- and after-treatment tracings of the maxilla on the palatal plane, registering on the anterior nasal spine (Fig 5, *A*). The case illustrated is of

Fig. 4.



A.

B.

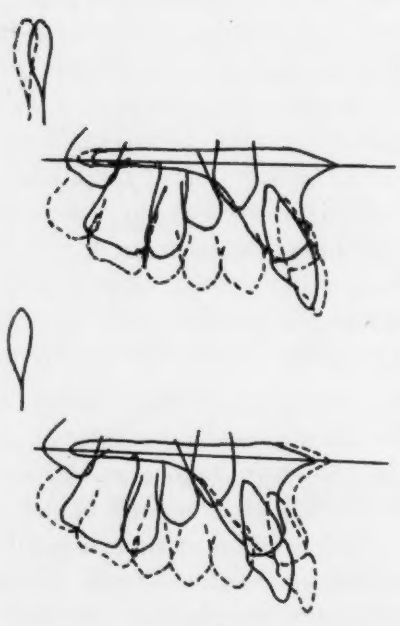


Fig. 5.

Fig. 4.—Patient with cephalometric tracings oriented upon the sella nasion line and with sella registered. (From Brodie: Am. J. Orthodontics & Oral Surg. 27: 633-647, 1941.)

Fig. 5.—*A*, Maxillary dentures of same patient between 10 and 13 years of age superimposed upon palatal plane and registered upon anterior nasal spine. *B*, Same patient's tracings superimposed upon palatal plane and registered upon the anteroposterior position of the pterygomaxillary fissures.

a child growing normally without orthodontic intervention between the ages of 10 and 13 years. It may be noted that when this method is followed the pterygomaxillary fissure appears to move distally and the teeth to erupt straight downward from their original position. Originally, this method of superimposing was adopted with the thought of nullifying the effects of growth at the tuberosity upon the position of the teeth. The results could then be interpreted in an anteroposterior direction as being a change due to tooth movement alone. There is evidence, however, that quite often the anterior nasal spine will grow independently of the primary growth sites of the maxilla, at least during adolescence. For this reason, and because we are interested in the effects of growth as well as of orthodontic treatment on the position of the maxillary denture, it was decided to superimpose the maxilla on the palatal plane, registering the pterygomaxillary fissures. Fig. 5, *B* illustrates the results of this method of superimposing upon the same example used previously. Now it appears that the anterior nasal spine has moved forward due to growth and that the maxillary denture has been carried forward with it. The teeth have appeared to erupt downward and forward in relationship to the pterygomaxillary fissure.

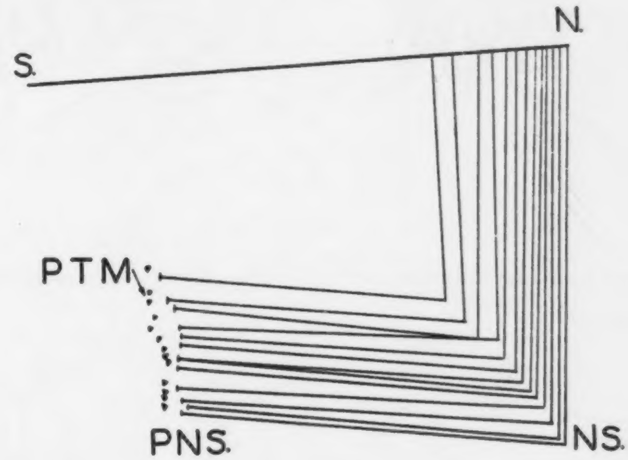


Fig. 6.—Graphic portrayal of the relative constant anteroposterior relationships of the pterygomaxillary fissure (*PTM*) to sella turcica (*S*), contrasted to the change in position of the anterior nasal spine (*NS*), between 3 months and 8 years of age. (From Brodie: *Am. J. Anat.* **68**: 209-262, 1941.)

It was first pointed out by Broadbent and later confirmed by Brodie and numerous other students of growth that the pterygomaxillary fissure maintains a relatively constant position anteroposteriorly in relation to cranial landmarks during the entire growth process (Fig. 6). This finding is based upon the serial study of a large group of persons. Generally speaking, the pterygomaxillary fissure moves in a downward direction in relation to the sella nasion line or the Bolton plane during the growth process. The important consideration, however, is how it behaves in relation to the other facial parts during the growth process. When individuals are studied, it may be generalized that the pterygomaxillary fissure descends in a vertical plane in relation to cranial

landmarks, while the anterior nasal spine, maxillary incisors, and chin point move in a downward and forward direction. This relationship would be expected, since the forward growth of the maxilla occurs by deposition of bone upon the maxillary tuberosity. Thus, the maxilla, by apposition on its posterior aspect, virtually pushes itself forward from this region during the growth process of the head. The method of superimposing shown in Fig. 5, *B* graphically illustrates the normal growth process of the maxilla. It was selected, therefore, as the method to be used for observing the effect of orthodontic treatment upon the denture as well as the maxillary growth pattern.

The effect of orthodontic treatment upon the mandible was evaluated by superimposing the cephalometric tracings on the cross section of the symphysis

Fig. 7.

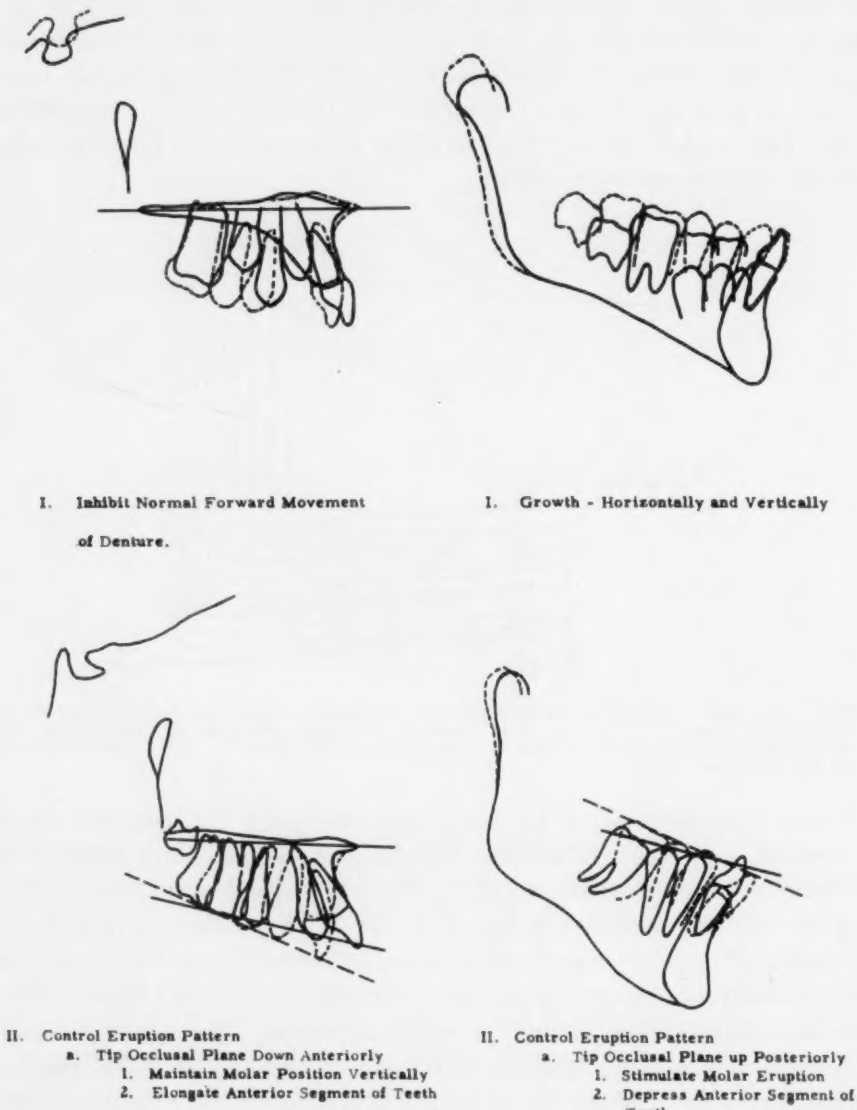
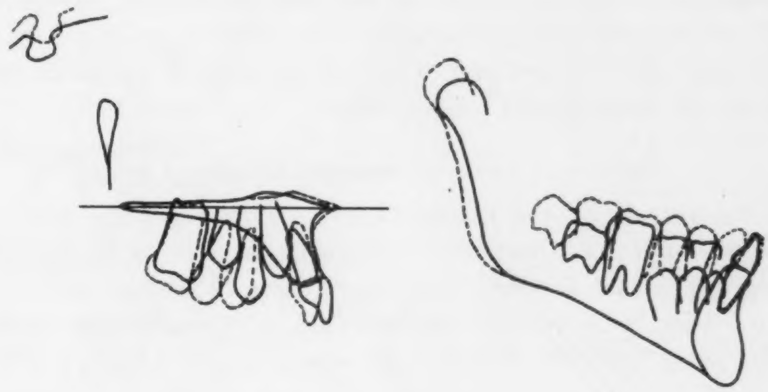


Fig. 8.

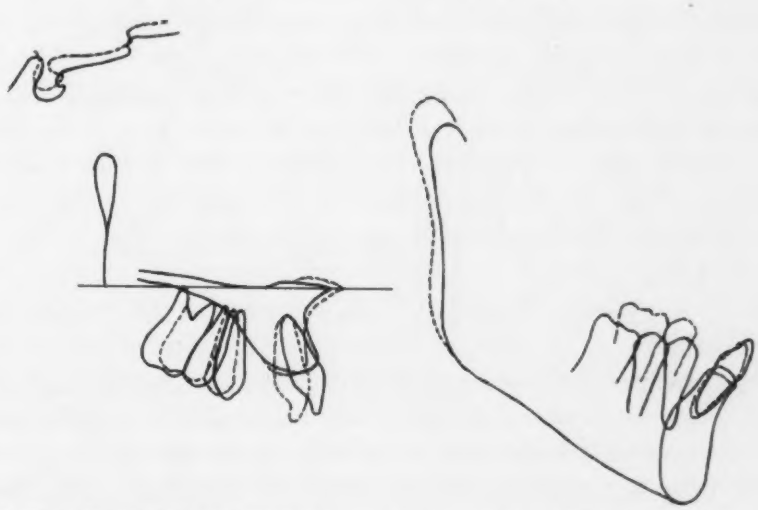
and the lower border of the mandible. By this means of orientation, the actual growth process of the mandible can be evaluated. The actual amount of growth on the posterior border of the ramus and the mandibular condyle, as well as the eruption pattern of the teeth, between the two ages studied can be observed.

Using these methods of evaluation, an analysis was made of the factors that were evident in the orthodontic treatment result of a group of Class II malocclusions. The factors that were postulated as being potentially important in the treatment result can be individually analyzed by the methods of superposing proposed. Figs. 7 to 10 illustrate the method of interpreting the results. Fig. 7 shows a maxilla in which the normal forward movement of the

Fig. 9.



III. Move Denture Posteriorly. III. Move Denture Anteriorly.



IV. Create Space in Which to Move Teeth by Selective Extractions. IV. Create Space in Which to Move Teeth by Selective Extractions.

Fig. 10.

denture had been inhibited. It may be noted that the anterior nasal spine has moved forward in relation to the pterygomaxillary fissure; thus, there is no evidence of inhibition of forward growth of the maxilla. In the same illustration the amount of mandibular growth may be evaluated. Fig. 8 shows the effect of tooth movement and the control of the occlusal plane through mechanical therapy for both the maxilla and the mandible. Fig. 9 illustrates an example in which the maxillary denture had been moved posteriorly and the mandibular denture had been moved anteriorly. Fig. 10 shows the denture relationship achieved in the maxilla and mandible in which teeth had been extracted in order to create space for movement. The role of each of these factors varies with the age of the Class II malocclusion patient to be treated. For this reason, the analysis to be presented has been divided into three parts according to the age groups of the patients studied. These age groups are (1) 7 to 11 years (mixed dentition), (2) 12 to 16 years (early permanent dentition), and (3) 17 years and over (late permanent dentition) groups. Selected cases will be presented for evaluation.

RESULTS OF ANALYSIS GROUPED ACCORDING TO AGE

The 7- to 11-Year Age Group (Mixed Dentition).—The case selected to illustrate the effect of orthodontic treatment on a Class II malocclusion for this age group is that of a boy who was 9 years 10 months old at the start of treatment. Fig. 11 represents the maxillary and mandibular changes which occurred during treatment between the ages of 9 and 11 years with posterior traction to the maxillary first permanent molars by means of occipital anchorage. Headcap treatment (Kloehn's method) was all that was used in this particular case. It may be noted that the maxillary denture has not moved forward in relation to the pterygomaxillary fissure, which is the point of registration; in fact, the maxillary teeth actually have been tipped back somewhat from their original position. The anterior nasal spine has moved forward, however, in relation to the pterygomaxillary fissure. The mandibular superimpositioning illustrates a great deal of growth in both the horizontal and the vertical planes of space. An appliance was not used on the mandibular denture. Fig. 12 illustrates the over-all facial change by superimposing on the sella nasion line, registering upon sella turcica. The molar relationship has changed from Class II to Class I, and the incisors are in normal anteroposterior relationship. There has been a marked improvement in the facial profile of this boy.

In the original hypothesis presented earlier, it was postulated that there were ten possible factors that, alone or in combination, could be associated with the successful treatment of a Class II malocclusion. Five of these were associated with the maxilla and five with the mandible. An analysis made of this particular treatment result reveals that the normal forward growth of the maxilla has not been effected, although the normal forward movement of the maxillary denture has been inhibited. The eruption pattern of the maxillary

teeth has been altered, and the maxillary denture has been moved slightly posteriorly. Thus, three of the possible factors postulated for the maxilla have been fulfilled.

With regard to the mandible, there has obviously been a great deal of horizontal and vertical growth. Whether or not this was stimulated by the orthodontic forces used is doubtful, since an appliance had not been placed upon the mandibular arch. It is obvious, however, that the mandible has not been repositioned more anteriorly, for Fig. 12 shows that the mandibular condyle is in a more posterior position in relation to cranial landmarks after treatment than it was before.

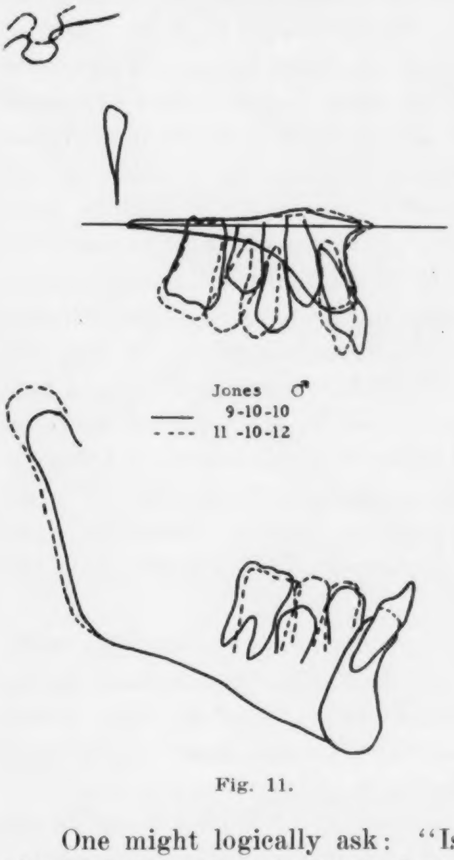


Fig. 11.

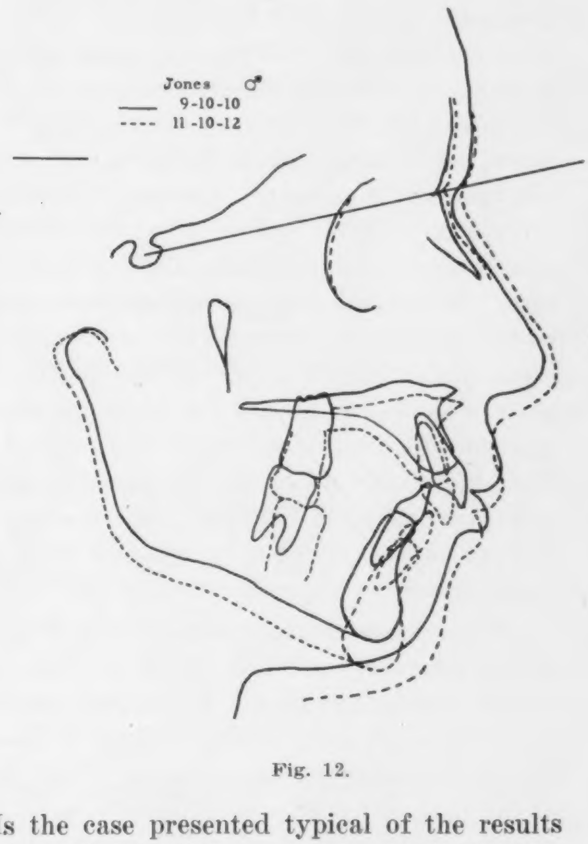


Fig. 12.

One might logically ask: "Is the case presented typical of the results obtained through orthodontic forces in the 7- to 11-year age group?" Forty-six children with Class II malocclusion, who had been under orthodontic treatment for not less than one year, were studied by a similar method of analysis. In the event that the postulate that growth factors have influenced the treatment result is correct, it should be expected that this age group would be the one most affected. In order to evaluate this theory, the effects of growth upon the facial pattern of children of this age range who did not receive orthodontic treatment were explored also.

A control group of thirty-four untreated children growing between the ages of 8 and 11 years of age was studied in order to record the variation in

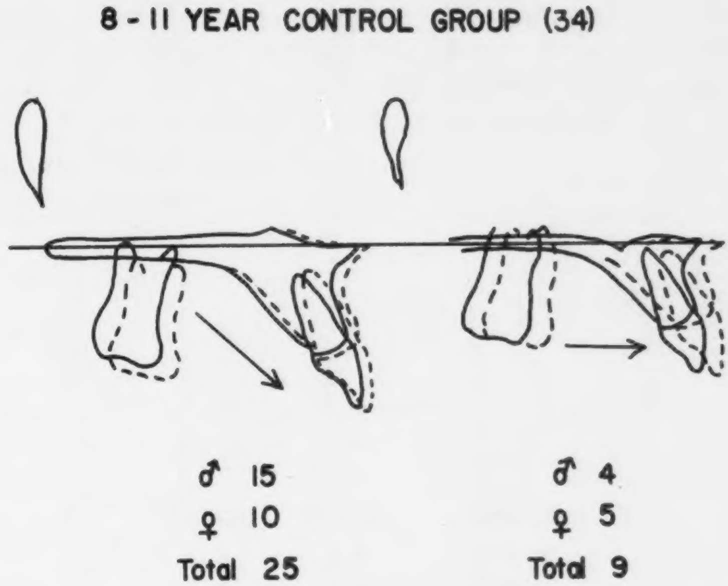
the general growth pattern. In all cases the anterior nasal spine moved forward in relation to the pterygomaxillary fissure (Fig. 13). The denture and alveolar process were carried along with the forward growth of the maxilla. In twenty-five of these cases the denture grew in a downward and forward direction; in nine the denture moved forward but did not show evidence of eruption of teeth. All of the children in this group had mesognathic profiles in varying degrees. The process of growth of the maxilla is the same, however, regardless of the facial type. For this reason, it was felt that this group could serve as a control for the group of children with Class II malocclusions.

The children who had received orthodontic treatment were treated by posterior traction on the maxillary molars by Kloehn's method of headcap treatment and were of the same age range as the untreated controls. Most of these children had retrognathic facial profiles in varying degrees. There were forty-six children in the treated group. When these children were evaluated in the same manner as the control group it was found that in the majority of cases the anterior nasal spine moved slightly forward in relation to the pterygomaxillary fissure (Fig. 14). The growth process of the denture, however, was modified from that of the control. In eighteen cases the denture moved downward and backward in relation to its original position, in fourteen cases the denture moved straight downward, and in nine cases the denture moved straight backward without evidence of eruption of teeth. In only five cases of the treated group did the denture move downward and forward in a pattern similar to that of the control group. In all cases the altered eruption pattern affected the premolars and canines in the same manner as the molars. It should also be noted that in all cases the cross section of the incisor alveolar process remained in the same relative anteroposterior position in relation to the pterygomaxillary fissure before and after treatment. This is contrary to the normal growth pattern seen in Fig. 13.

These same children, control and treated groups, were evaluated in terms of the convexity of their facial profiles. Of the thirty-four children in the control group, twenty-six maintained the same convexity of the face during the growth period (Fig. 15). Three of these faces became more concave and five became more convex. The degree of change in the convexity or concavity of the face, however, was extremely small and amounted to only 1 mm. in the relative position of the maxilla when related to a line drawn from nasion to pogonion. The treated cases varied from the pattern of the control (Fig. 16). Seventeen of the forty-six treated cases exhibited no change in convexity of the face, whereas twenty-eight showed a decrease in the convexity or a tendency for the face to become less convex. In only one case did a face become more convex, and this again was to the extent of only 1 mm. From this, it may be concluded that orthodontic treatment has influenced the facial profile outline.

It has been postulated in the past that the growth pattern of the mesognathic person tends to make the person even more mesognathic. This was

Fig. 13.


8 - II YEAR CONTROL GROUP (34)
♂ 15
♀ 10
Total 25
♂ 4
♀ 5
Total 9

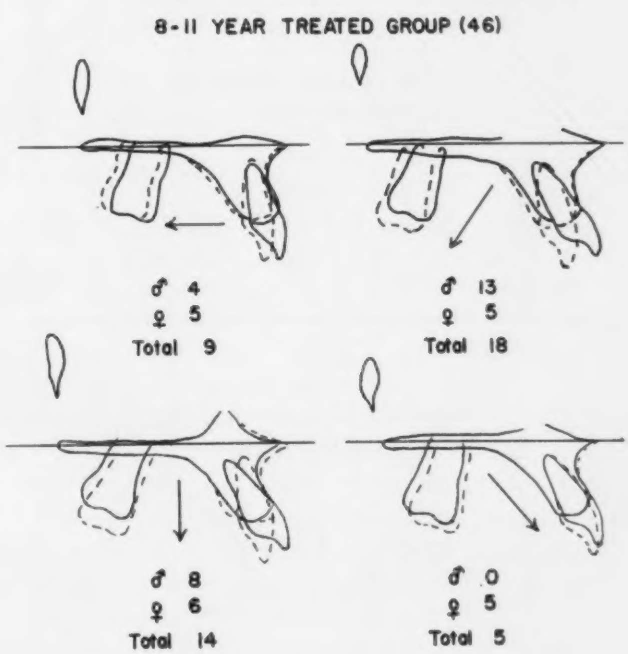
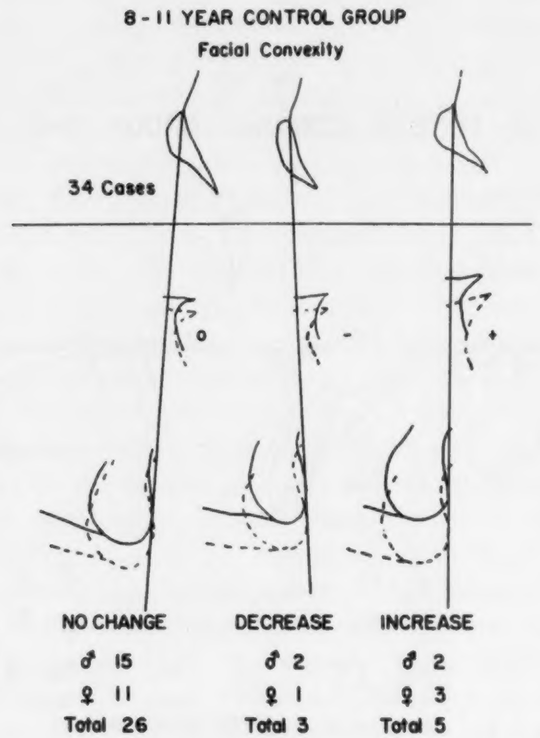

8-II YEAR TREATED GROUP (46)
♂ 4
♀ 5
Total 9
♂ 13
♀ 5
Total 18
♂ 8
♀ 6
Total 14
♂ 0
♀ 5
Total 5

Fig. 14.

Fig. 15.


8 - 11 YEAR CONTROL GROUP
Facial Convexity
34 Cases
o
-
+
NO CHANGE
♂ 15
♀ 11
Total 26
DECREASE
♂ 2
♀ 1
Total 3
INCREASE
♂ 2
♀ 3
Total 5

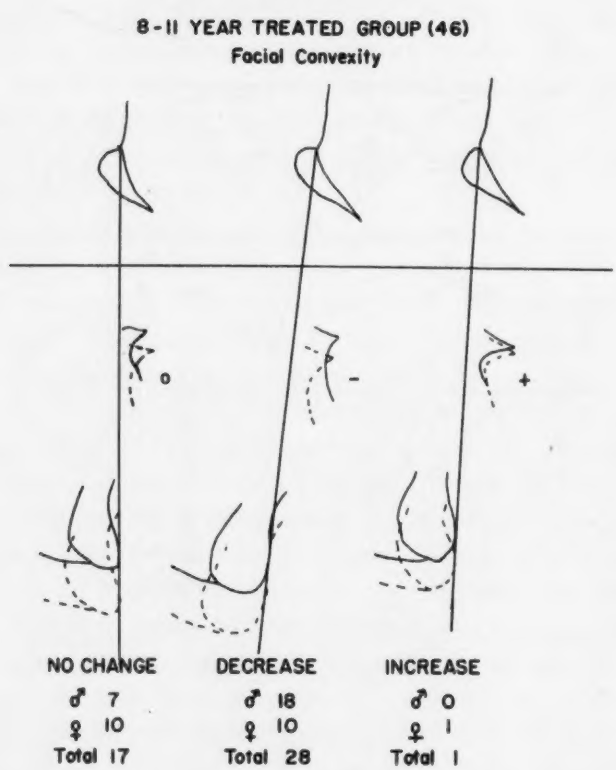

8 - 11 YEAR TREATED GROUP (46)
Facial Convexity
o
-
+
NO CHANGE
♂ 7
♀ 10
Total 17
DECREASE
♂ 18
♀ 10
Total 28
INCREASE
♂ 0
♀ 1
Total 1

Fig. 16.

pointed out earlier in this article when maturation changes were discussed. All of the persons upon whom the maturation study was performed had mesognathic facial profiles. When the control group of children between the ages of 8 and 11 years was evaluated as to the position of the chin point in relation to the cranium, this observation was confirmed (Fig. 17). In thirty of the thirty-four children studied, the chin point moved forward in relation to cranial landmarks, while in four it remained in relatively the same anteroposterior position.

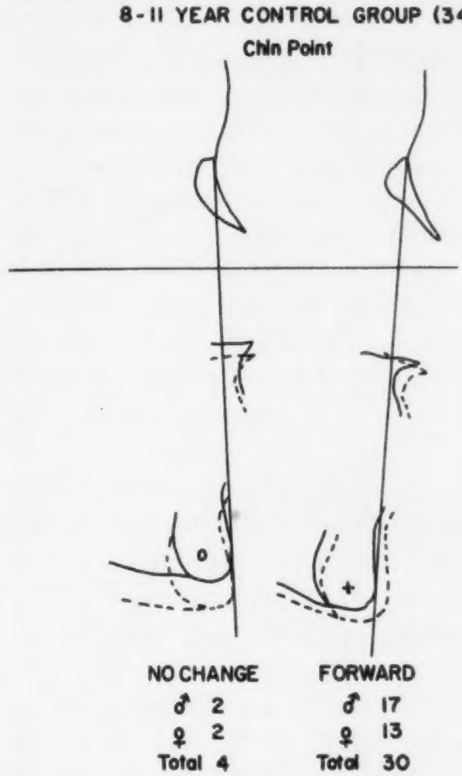


Fig. 17.

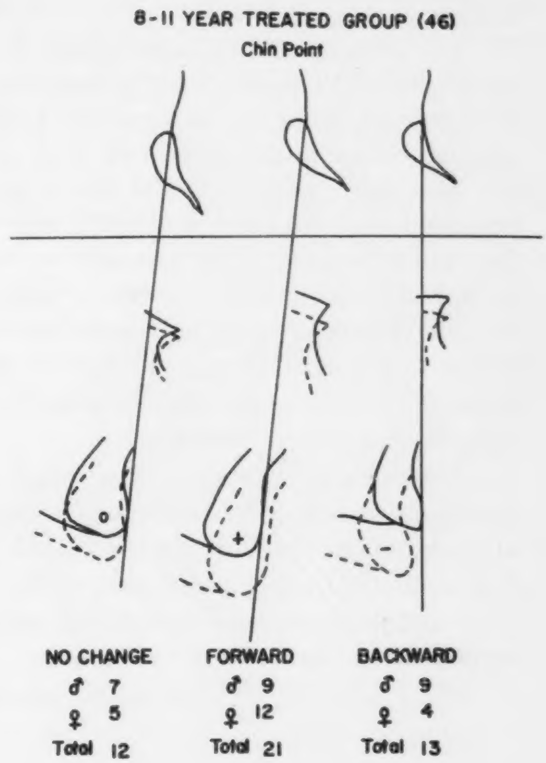


Fig. 18.

As was previously pointed out, all children in the treated group had retrognathic profiles. It has been speculated in the past that retrognathic facial profiles tend to stay the same or become more retrognathic through growth. When this treated group was evaluated as to the relative position of the chin point to cranial landmarks, it was found that twelve of the forty-six cases remained relatively the same (Fig. 18). In twenty-one cases the chin point became more prognathic, and in thirteen cases the chin point became more retrognathic in relation to cranial structures. It should be pointed out, however, that even though thirteen of the cases tended to become more retrognathic, the convexity of the facial profile remained the same or improved in all but one case. This can be accounted for by the tremendous amount of vertical growth of the faces of the treated group when compared with the horizontal vector of growth.

On the basis of these results, it can be concluded that in treating patients with retrognathic facial profiles and Class II malocclusions the orthodontist can inhibit the normal forward movement of the maxillary denture and its alveolar process and alter the eruption pattern of the maxillary teeth. If at the time this is being accomplished sufficient concomitant growth occurs within the mandible proper, the patient's facial profile outline will become less retrognathic. It must be recognized also that growth of the face in a vertical direction as a result of eruption of teeth and growth in height of the mandibular ramus also will tend to improve or change the convex profile to a less convex one.

The analysis of this large group of patients again confirms that three of the possible factors originally postulated for the maxilla have been validated. With the change in the facial profile recorded, it is obvious that there has been adequate mandibular growth in both a horizontal and a vertical direction. The only other possible factor that might be questioned in the results of the treatment of these cases is anterior repositioning of the mandibular body. In this connection, the same forty-six treated cases have recently been analyzed by Moran,[11] who found that when the anteroposterior position of the mandibular condyle was related to cranial landmarks no significant change was reflected in a comparison of the before- and after-treatment records. It must be concluded, therefore, that the mandibular body did not undergo an anterior repositioning during treatment.

According to this study, the orthodontist does not have to accept an unyielding constant facial pattern as a limitation in orthodontic therapy. If he will treat his patients during the growth period, his therapy may have a favorable influence upon the ultimate facial pattern. Maturation changes in the facial profile have been noted, but orthodontic treatment may augment or supplement these changes.

The success of the orthodontic treatment of Class II malocclusions in the 7- to 11-year age range is due largely to two factors: (1) the child's face is developing and growing rapidly during this period and (2) the maxillary premolars and canines are still unerupted and their eruption pattern is altered by posterior traction upon the maxillary molars, so that they erupt into a more normal relationship with their mandibular antagonists.

The 12- to 16-Year Age Group (Early Permanent Dentition).—The children in this age group are still actively growing. For the most part, however, their permanent dentition has erupted into full occlusion. In the majority of instances, orthodontic treatment during this period will require full appliance therapy. The first case selected to illustrate the results of treatment in this age group is one that transcends the arbitrary age grouping in this article. It is the case of a male Class II, Division 1 malocclusion in a boy. Treatment, which took place between the ages of 12 and 14 years, began with occipital anchorage upon the maxillary denture alone until all of the primary teeth were shed and then consisted of twelve months of full appliance therapy to

correct the remaining malocclusion. The maxillary superimpositioning (Fig. 19) shows that the crowns of the posterior teeth were held in the same relative anteroposterior position in relation to the pterygomaxillary fissure as before treatment was started. It also will be noted that there has been no forward migration of the maxillary denture or its alveolar process. The anterior nasal spine has grown forward during this period of time. The mandibular superimpositioning shows that the mandible has grown in height as well as length and that the mandibular denture is located slightly more forward on its base than it was at the start of orthodontic treatment. The over-all change in facial pattern (Fig. 20) shows the molars in normal Class I position and normal incisor relationship. There has been a definite improvement in the facial pattern of this boy.

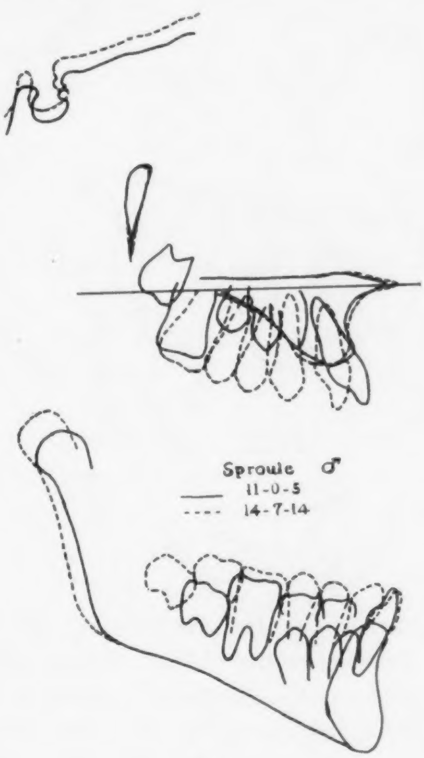


Fig. 19.

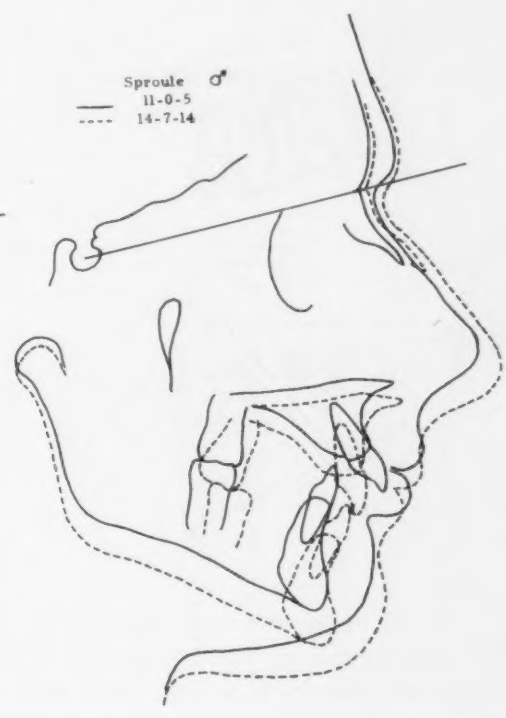


Fig. 20.

Relating the changes described above to the factors that were originally postulated as influencing treatment results, the following can be observed: There is no evidence that the normal forward growth of the maxilla proper has been inhibited, although the normal forward movement of the maxillary denture has been retarded. There has been a desirable amount of mandibular growth in both height and length. In regard to the occlusal plane, it has been tipped up slightly at its posterior end. There has been a slight distal movement of the maxillary denture and a forward movement of the mandibular denture upon its base. No extraction was resorted to in the treatment of this

case, so that was not a factor in the tooth position achieved. The mandible is in its same anteroposterior position in relation to cranial landmarks, so the effect of anterior repositioning of the mandible can be ruled out. The success of treatment in this case can, therefore, be attributed to the combination of several of the postulated factors, with the growth factor being predominantly the most important.

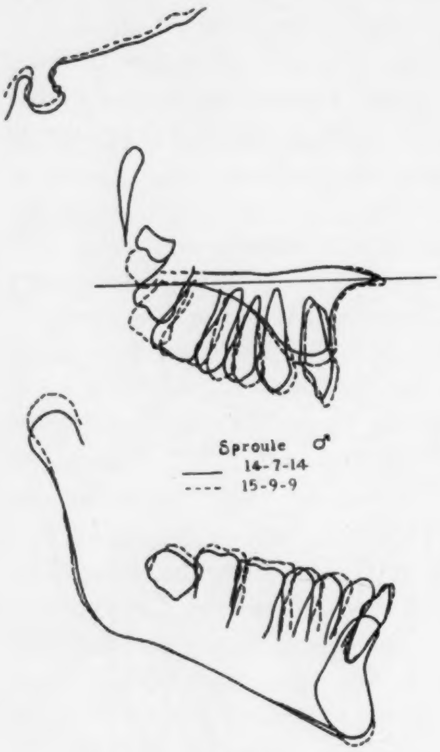


Fig. 21.

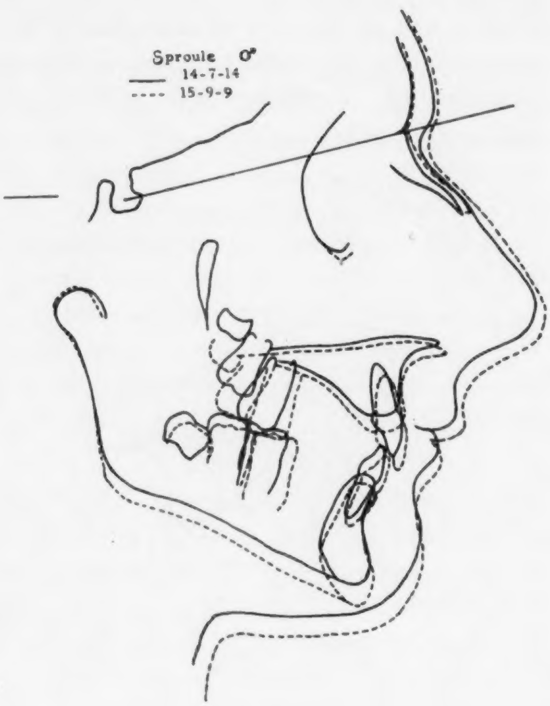


Fig. 22.

Fig. 21 shows a comparison of the final record of the case just reported with another record taken one year later. It will be noted that the maxilla has moved downward and forward following the normal growth pattern now that posterior restraint has been removed from the maxillary denture. The occlusal plane has remained essentially the same. The mandible, however, has continued to grow, which is favorable to the maintenance of the treatment result. In passing, it may be noted in this mandibular superimpositioning that there has been some deposition of bone on the anterior part of the symphysis during the interval of one year. This has been described by others and is considered a maturation change which occurs in some persons. The over-all superimpositioning (Fig. 22) shows that the facial pattern is now maintaining a constant form and that there has been some improvement in the settling process as far as the long axis of the molars is concerned. The occlusal result achieved through treatment has remained stable because of a satisfactory growth pattern. It may be pointed out at this point, however,

that if the facial pattern of an original Class II malocclusion does not maintain a favorable growth direction following orthodontic treatment, then a tendency for relapse of the established occlusion can be expected. Utilizing knowledge of growth, however, these cases can be recovered by applying posterior force to the maxillary denture to inhibit the normal forward movement of the maxillary denture and take advantage of any additional growth that might be left within the mandible itself. Such cases should be retained by occipital anchorage until the entire growth pattern is completed if a successful end result is to be maintained.

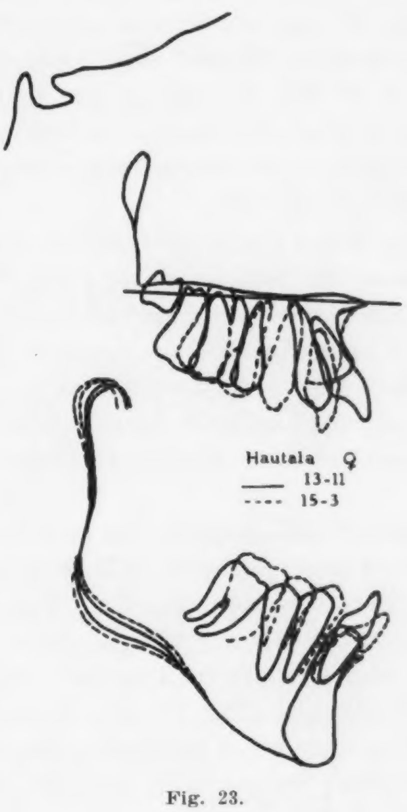


Fig. 23.

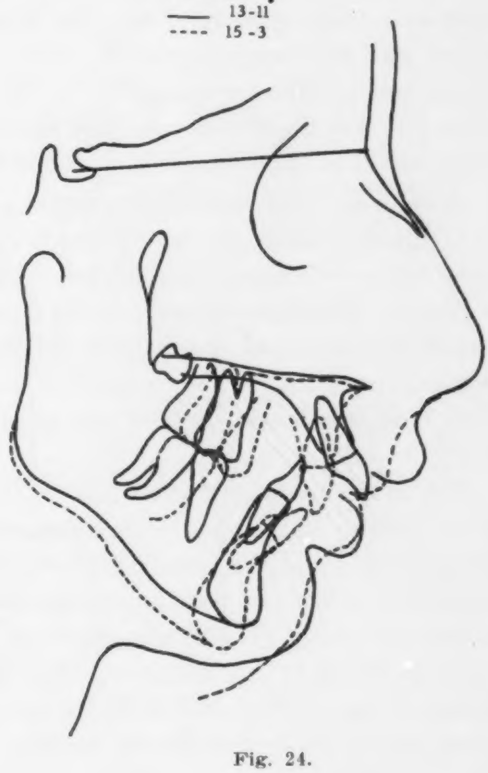


Fig. 24.

The next case is that of a girl who was very close to the end of her facial growth period when treatment was commenced. She was approximately 14 years of age (Fig. 23). It will be noted in the maxillary superimpositioning that there has not been any forward growth of the maxillary denture and that the maxillary second molars and first premolars have been removed. The maxillary first permanent molars have been moved distally approximately 3 mm. into the space created by the second molar extraction, and the canine has been moved back into the first premolar area. The incisors have been tipped downward and back from their original axial inclination. The occlusal plane has been tipped down in the anterior region, while the same level has been maintained in the posterior part of the mouth. The mandibular super-

impositioning reveals that the mandibular first permanent molars were lost before the patient was ever treated, so no extraction was resorted to in this arch. The mandibular second molars were uprighted and moved forward several millimeters, and the lower incisors were depressed and moved labially to some degree. The mandibular occlusal plane has been tipped up in back and down in front, and the mandible exhibits a slight amount of growth during this period.

The over-all evaluation of this case (Fig. 24) shows a marked improvement in the relationship of the anterior part of the denture to the face. There has been no improvement in the skeletal pattern; in fact, if anything, it is even more retrognathic. The change in the anterior denture relationship has produced an esthetic improvement of the lips which conceals the fact that the skeletal pattern has not been improved. The lack of improvement in the skeletal pattern can be directly attributed to the lack of growth during the treatment period. It was a difficult case, and the end result is as satisfactory a compromise as could be expected without the aid of facial growth.

A review of the postulated factors again shows that growth played a very small role inasmuch as the patient was near the completion of her growth period before treatment was started. The removal of teeth and the tipping of the occlusal plane has helped a great deal in correcting the malocclusion. The forward movement of the mandibular incisors and the posterior movement of the maxillary incisors have provided the improved anterior denture relationship. This relationship would not have been achieved without extraction of teeth.

The next case is that of a Class II, Division 1 malocclusion that had crowding of both dental arches before treatment was commenced. The maxillary first premolars and the mandibular second premolars were removed. The case was started when the patient was approximately 13 years of age. Since the patient was a boy, growth was expected to play a role in the treatment result. It will be noted by the maxillary superimpositioning (Fig. 25) that there has not been a forward migration of the maxillary denture or its alveolar process; in fact, the cross section of the anterior alveolar process is in approximately its same anteroposterior position. Growth of the anterior nasal spine in a forward direction has occurred; from this it may be interpreted that the maxillary growth has not been affected by treatment. The maxillary canines have been moved back into a more posterior position, which has made room for the retraction of the incisors. The mandibular molars have been moved forward and the first premolars have been carried posteriorly. The mandible exhibits a great deal of growth in both height and over-all length, and the lower incisors have been retracted and slightly depressed while the molars have been elevated. The mandibular occlusal plane has been altered markedly from its original position. Fig. 26 indicates the over-all change in the facial pattern and shows an improvement in the facial profile as well as in the relationship of the denture to the face.

A review of the treatment factors active in this case indicates that the normal forward movement of the maxillary denture has been inhibited and that there has been excellent mandibular growth. The occlusal plane has been altered in both the maxillary and the mandibular dentures, and the maxillary anterior teeth have been moved posteriorly by virtue of space for their movement having been provided through extraction. This case, therefore, has utilized most of the factors that were postulated as influencing treatment results. It may be noted that the mandible after treatment is in the same relative anteroposterior position as it was before treatment, so it may be concluded that the mandible has not been repositioned anteriorly.

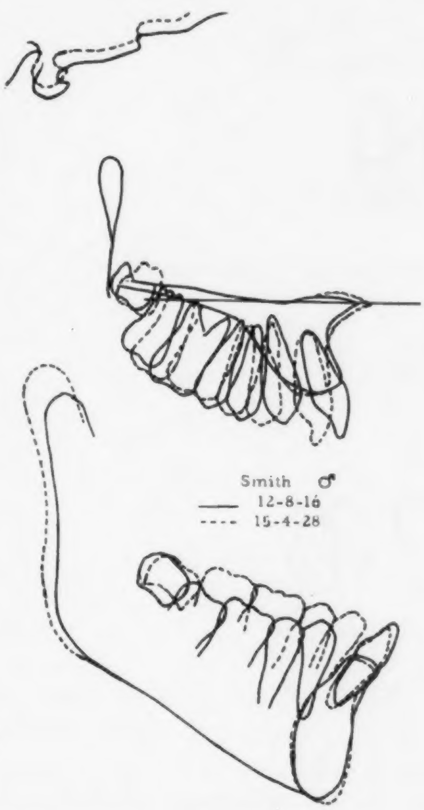


Fig. 25.

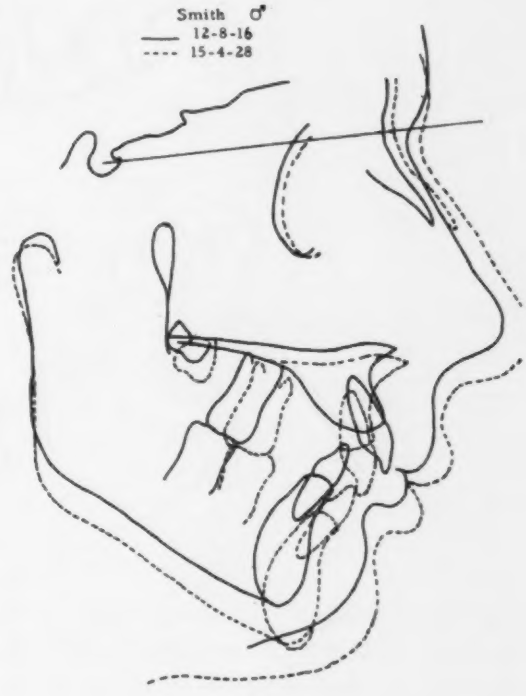


Fig. 26.

The cases that have just been presented to illustrate the treatment factors in the 12- to 16-year age group were selected because they illustrate all of the various possibilities. It should be emphasized again that growth is a valuable ally to all orthodontic procedures and that treatment time should be planned to utilize it to the fullest. The case of the girl who started treatment at 14 years of age would have had a much more favorable prognosis if treatment had been started in time to take advantage of her growth potential, however limited it might be.

The 17-Year and Over Group (Late Permanent Dentition).—Most orthodontic cases started at this age level have a severe limitation placed upon them

from the outset. Little or no growth can be expected during this period, so the orthodontist must content himself with achieving his result by tooth movement alone. The patient's basic facial pattern cannot be influenced by orthodontic treatment after growth has ceased. The case selected to illustrate this period is that of a man who was 28 years of age at the start of treatment. He had a Class II, Division 2 malocclusion in which maxillary and mandibular third

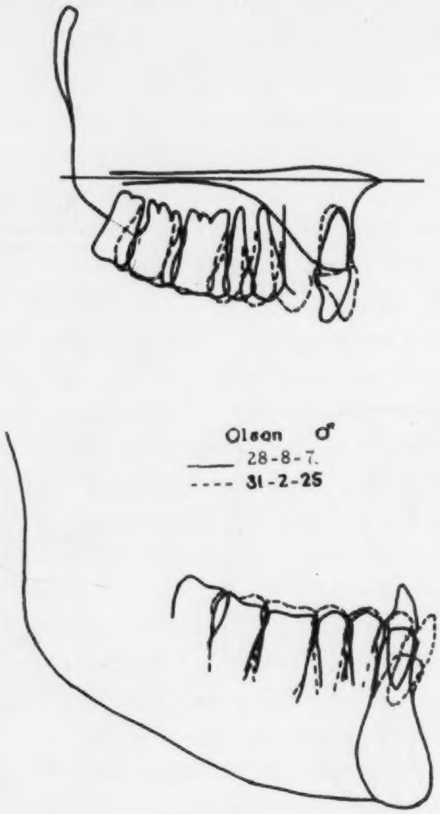


Fig. 27.

molars were removed in order to make room for the movement of teeth. In the maxillary superimpositioning (Fig. 27) it may be noted that the upper incisors have been tipped forward and that the posterior segments have been moved distally into the space created by the extraction of the third molars. The mandibular denture shows a leveling of the occlusal plane with a marked depression of the lower incisors which, in effect, has produced a forward position of the mandibular denture upon its base. The over-all superimpositioning (Fig. 28) illustrates normal molar and incisor relationships following treatment. There has been a marked improvement in the facial profile in this case.

Reviewing the factors associated with the correction of this malocclusion, it is found that they are all related directly to orthodontic tooth movement. The

maxillary buccal segments have been moved posteriorly while the mandibular incisors have been moved forward to improve the incisor relationship. The occlusal plane has been altered in order to achieve the treatment result. There has been a slight increase in the denture height of the face; however, it may be noted that the mandible has not been repositioned forward in relation to cranial structures.

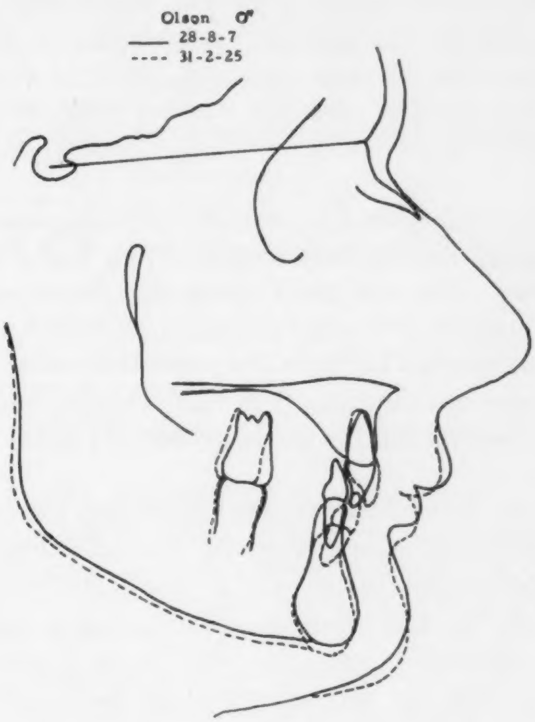


Fig. 28.

Since growth cannot be expected for this age group, especially in those patients who have passed their twentieth birthdays, the results achieved through the orthodontic correction of Class II malocclusion must be obtained entirely through tooth movement. If there is not space for the movement of teeth in the dental arch to a more correct position, then selective extractions must be resorted to if a successful result is to be achieved.

DISCUSSION

At the beginning of this article a hypothesis was formulated by postulating all of the various possible factors that might be associated with the orthodontic correction of the Class II malocclusion. Now that an analysis has been made of the actual factors involved in treatment results of the Class II malocclusion, a review should be made of the original hypothesis.

The first of the possible factors postulated for the maxilla was the inhibition of the normal forward growth of the maxilla. In the review of the

cases presented, there was no positive evidence to prove that orthodontic treatment influenced the normal forward growth of the maxilla. This conclusion is based on the fact that the anterior nasal spine progressed forward in relation to the pterygomaxillary fissure in most cases where growth was occurring regardless of the orthodontic procedures being used. Whether or not the anterior nasal spine would have progressed further forward with growth in the absence of orthodontic intervention is an unanswered question.

The second factor for the maxilla, the inhibiting of the normal forward movement of the maxillary denture, has been definitely substantiated. Posterior traction on the maxillary denture, whether with occipital anchorage or elastic traction, inhibited the normal forward movement of the maxillary denture.

The third factor, the control or alteration of the normal eruption pattern of the maxillary teeth, was definitely proved to be a factor in the correction of Class II malocclusion. This was borne out by the effect of occipital anchorage upon the eruption pattern of unerupted premolars as well as by the alteration of the occlusal plane through intermaxillary elastic traction.

The fourth factor was also proved in that evidence was presented to show that the maxillary denture may be moved posteriorly in the treatment of some cases.

The fifth and last factor listed for the maxilla was the creation of spaces in which to move teeth by selective extractions; this, of course, was substantiated as a factor for the successful treatment of a Class II malocclusion.

In the mandible the first of the possible factors postulated as being associated with the successful correction of a Class II malocclusion was the stimulation of horizontal and vertical growth of the mandible. As yet, there is no way of determining whether or not the growth which occurs in a horizontal and vertical direction on the ramus of the mandible is stimulated by orthodontic therapy. It is known, however, that growth does occur and that it is very important in the successful treatment of the Class II malocclusion.

The second factor, the control or alteration of the normal eruption pattern of the mandibular teeth, has been substantiated as an important cog in the wheel of successful treatment.

The third, movement of the mandibular denture forward upon its skeletal base, was also shown to contribute to the result achieved in some cases.

The fourth factor, the repositioning of the mandibular body anteriorly in relation to cranial structures, was not found in any of the cases studied. Anderson,[12] in a recent study of the treatment results in twenty-eight Class II, Division 1 malocclusions, concluded that in no case where a successful result had been achieved had the mandibular condyle been repositioned anteriorly in relation to cranial landmarks. On the basis of this and the present study, permanent anterior repositioning of the mandibular body should not be counted upon as a possible treatment factor in producing a stable successful end result.

The last of the mandibular factors was the creation, by selective extractions, of space into which to move teeth; this, of course, was shown to be a vital factor in the results achieved in some of the cases.

In recapitulation, Table II lists the factors for both the maxilla and the mandible that have been shown by this study to be effective in the successful treatment of the Class II malocclusion.

TABLE II

Maxilla
I. Inhibit normal forward movement of denture
II. Control eruption pattern
a. Guide unerupted teeth into a more posterior path of eruption
b. Tip occlusal plane down anteriorly
1. Maintain molar position vertically
2. Elongate anterior segment of teeth
III. Move denture posteriorly
IV. Create space in which to move teeth by selective extractions
Mandible
I. Growth—horizontally and vertically
II. Control eruption pattern
a. Tip occlusal plane up posteriorly
1. Stimulate molar eruption
2. Depress anterior segment of teeth
III. Move denture anteriorly
IV. Create space in which to move teeth by selective extractions

One possible question might be asked in objection to the above factors being the sole mechanism by which Class II malocclusions are successfully treated: "How do you account for the sudden change from Class II to Class I molar relationship during treatment of many Class II malocclusions?" This can best be answered by the diagram in Fig. 29.

At the start of treatment we see a Class II relationship between the teeth in occlusion as well as at rest position. After six months the teeth in occlusion are still in full Class II relationship. However, at rest position, as a result of either mandibular growth or inhibition of the normal forward movement of the maxillary denture, it is found that the molar relationship more nearly approaches an end-to-end relationship. After nine months the teeth in occlusion are still in full Class II molar relationship. The teeth at rest position are now end to end, however, but as they come under the influence of the inclined planes going into occlusion they still appear to be in a Class II relationship. After ten months the mandibular molars are now closer to a Class I relationship in rest position, but they still tend to be in an end-to-end or cusp-to-cusp position. In occlusion, however, coming under the influence of inclined planes, the teeth appear to be in full Class I relationship. At the end of twelve months the molars are in a Class I relationship both at rest position and in full occlusion. The change in molar relationship from Class II to Class I did not occur in the intervening time between the ninth and tenth months, as might be supposed by noting the tooth relationship in occlusion only. This apparent change in one month's time was due to a very slight amount of movement which caused the inclined planes to shift their relationship and make it more comfortable

for the patient to bite forward rather than posteriorly. The actual correction was being gained over the entire year's time. If posterior traction upon the maxillary denture had been discontinued at the tenth month, full correction of the malocclusion would not have been achieved. It is necessary to continue posterior traction until the Class I molar relationship is firmly established both in rest position and in full occlusion.

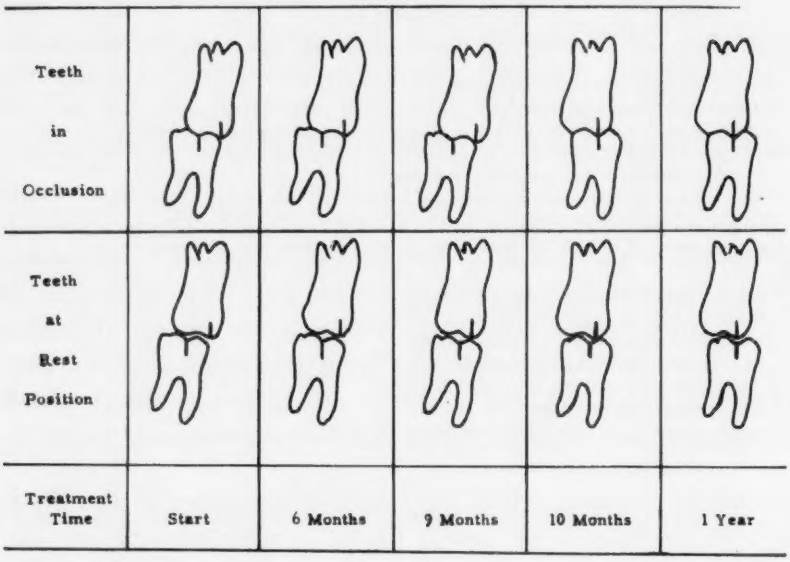


Fig. 29.

Altering the eruption pattern of the teeth by holding the maxillary buccal segments stationary while the mandibular buccal segments were being carried forward by the growth of the mandible itself was the actual factor in the correction achieved. It is not logical to expect that the amount of mandibular growth necessary to achieve such a correction could occur within one month's time. Many orthodontists have accused patients of not wearing elastics and then have found that between two appointments a noticeable change in occlusion has occurred and have concluded that the patient at last was cooperating. The odds are that the patient was cooperating throughout the time that he was supposed to be wearing elastics but it was not evident until the shift in occlusal relationship occurred in response to the change in the inclined plane relationships of the cusps of the teeth.

In conclusion, a word should be said about the type of appliance therapy that will utilize the factors that have been presented as being the answer to the successful treatment of Class II malocclusion. There are certain fundamental treatment procedures that will produce the desired objectives that have been reviewed. Table III shows the factors or objectives that should be sought inasmuch as they influence the successful treatment of Class II malocclusion. This table should be correlated with Table II. Opposite these objectives the various treatment procedures that will influence these factors

TABLE III. TREATMENT PROCEDURES

OBJECTIVES	MAXILLA	MANDIBLE
Growth (consider age and sex of patient)	Occipital anchorage Elastic traction	Pray! ! !
Eruption	Elastic traction Mechanical arch form Control of premolars (banded) Bite plate	Elastic traction Mechanical arch form Control of premolars (banded) Bite plate
Tooth movement	Posterior force Occipital anchorage Elastic traction Mechanical arch form (tipping)	Anterior force Elastic traction Mechanical arch form
Space in which to execute tooth movement	Extraction (mechanical arch auxiliaries to produce desired movement)	Extraction (mechanical arch auxiliaries to produce desired movement)

have been listed separately for the maxilla and the mandible. A close look at these treatment procedures reveals that successful treatment of the Class II malocclusion can be achieved with any of a number of the orthodontic appliances that are in use today. Some of the objectives may be met more easily and possibly more successfully by certain of the appliances. However, if the basic objectives can be fulfilled by any given appliance, then that appliance should not be condemned.

SUMMARY AND CONCLUSIONS

1. A method for analyzing the various factors associated with the successful treatment of the Class II malocclusion has been presented.

2. The factors associated with the successful treatment of the Class II malocclusion have been studied and evaluated.

3. An attempt has been made to show how a basic knowledge of growth of the head and the technique for its study can help in understanding and planning treatment for the Class II malocclusion.

4. By applying the knowledge of the normal pattern of facial growth and the influence of sex and age upon this growth pattern, the orthodontist is in a better position to predict what value growth may have in the successful handling of orthodontic problems.

5. The concept of "constancy of the facial pattern" should receive a more liberal interpretation than it has in the past. Variations in the rates of growth of the various component parts of the face will produce changes in the facial pattern during growth. This concept should be applied only to the general conformation of the average face.

6. Maturation changes of the facial profile in both males and females consist of the profile becoming less convex and the anterior teeth becoming more upright or less protrusive. These changes apply only to persons with mesognathic profiles and occur earlier in girls than in boys.

7. Since the growth and development of the facial pattern have been shown to be favorably influenced and modified by treatment during the period of rapid growth, treatment of all Class II malocclusions should be timed to correspond with this growth period.

8. Inasmuch as the use of occipital anchorage, as advocated and described by Kloehn, is the simplest means of favorably influencing the growth pattern of patients with retrognathic faces, it is, in my opinion, the treatment method of choice. Even though the case may be diagnosed as a potential extraction case, this treatment should still be considered for the advantage of improving the patient's over-all growth picture. The treatment result achieved through early inhibition of the normal forward movement of the maxillary denture will simplify the eventual extraction procedure that may be indicated, as well as improve the potential facial esthetics of the patient.

9. If there is insufficient room for the movement of teeth within the dental arches, then it must be concluded that, for the successful treatment of all adult Class II malocclusions, extraction of permanent teeth must be resorted to if a permanent balanced treatment result is to be achieved.

10. Treated Class II malocclusions with severe retrognathic facial patterns may tend to relapse in response to the influence of an unfavorable growth direction. These cases often may be recovered and retained by occipital anchorage. The retention period should be continued until the growth process has been completed if an optimum result is to be achieved.

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BONY PROFILE CHANGES RESULTING FROM CERVICAL TRACTION COMPARED WITH THOSE RESULTING FROM INTERMAXILLARY ELASTICS

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ACCORDING to Thurow[1] there are six possible causative factors in the Class II type of malocclusion: (1) overdevelopment of the maxilla, (2) underdevelopment of the mandible, (3) anterior position of the maxilla, (4) posterior position of the mandible, (5) forward positioning of the maxillary denture on the base, or (6) posterior positioning of the mandibular denture on the base. The orthodontic approach to treatment of the Class II malocclusion should be directed in such a manner as to attain maximum correction of the offending factor. Although compromises are frequently necessary if we are to cope with the vagaries of nature sufficiently to produce a desirable result, it is advisable to approach treatment with the knowledge of the situation which each particular case presents. To this end numerous analytic methods have been developed. The majority of these involve the use of the lateral headfilm or cephalometrics, which not only has given to orthodontics an invaluable aid in case analysis but, of at least equal importance, has made it possible for us to analyze accurately just what we have accomplished during treatment.

There are two general methods for correcting the mesiodistal abnormality in a Class II case—extraoral force (headgear) or intraoral force (intermaxillary elastics). The method of choice in a particular case might depend upon several factors, such as (1) case analysis, (2) cooperation from the patient, and (3) ability of the appliance and the operator to control tooth movement. If the case analysis shows that the maxillary base or denture is mainly at fault, the probable choice would be extraoral force. If the fault is mainly within the mandibular area, then intermaxillary elastics might be chosen with the understandable assumption that extraoral force is not going to improve the mandibular denture area. Cooperation on the part of the patient is necessary, since even the most expert operator can achieve nothing with either extraoral or intraoral force unless the patient follows instructions. Under certain circumstances, the patient's cooperation may be achieved when intermaxillary forces are used, whereas the attempted use of extraoral force would end in certain failure. The choice

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of appliance and the ability of the operator can sometimes modify the results of an elastic pulling just as hard from one end as from the other and thereby control to a limited degree the area affected by intermaxillary force.

From an analysis of forces used in Class II treatment, Bien[2] concludes that the headgear has fewer undesirable qualities than intermaxillary elastics as far as treatment results are concerned. Holdaway[3] varies the application of forces in his treatment to attain the greatest effect in the desired area and reports success in achieving forward mandibular positioning with the use of strong Class II elastics. Silverstein[4] and others report, however, that the forward movement of mandibular growth was inhibited rather than improved by Class II treatment. Urban[5] states: "In Class II treatment, the effect of intermaxillary elastic traction on lower denture and facial profile may be unfavorable except in cases which involve distal position of the teeth on the base bone." Kanter[6] says: "It is now becoming generally accepted that a relatively small percentage of Class II malocclusions can be corrected by a mesial movement of the mandibular dental arch, a repositioning of the mandible, or a combination of both." Still, in probably every practice there are cases with which the operator would be very satisfied if he could but reposition the mandible forward. Lindquist and Vorhies report a forward movement of the chin, when related to nasion, of 0.57 mm. in fifty-seven cases treated by Dr. Charles Tweed, but this includes Class I as well as Class II cases.[7] Lande's[8] study of the profile implied that this amount of change might even be expected in untreated cases, as the face tends to become less convex with age. Thus, in spite of the fact that Class II elastics would seem to encourage forward positioning of the mandible and growth, it appears from the literature that such does not happen with the frequency that might be expected.

The changes occurring in the maxillary area as a result of Class II treatment are not entirely agreed upon in the literature, although most writers concur in the opinion that there usually is some improvement in point A when it is related to the profile. According to Silverstein,[4] Class II treatment altered the normal growth tendency of the SNA angle, but these changes were not considered significant. Cervical traction increased the angle of convexity (as described by Downs[9]) an average of 2.8 degrees for Klein's[10] cases, and King[11] found a significant change in point A resulting from cervical anchorage. Surprisingly, King also found a significant anterior change in pogonion in the male patients studied, although no intermaxillary elastics were used.

GLOSSARY*

1. *Nasion:* the suture between the frontal and nasal bones.
2. *The center of sella turcica:* located by inspection of the profile image of the fossa.
3. *Orbitale:* the lowest point on the left infraorbital margin.
4. *Pogonion:* the most anterior point on the mandible in the midline.

*After Downs, W. B.: Am. J. Orthodontics 34: 816, 1948.

5. *Point A—subspinale:* the deepest midline point of the premaxilla between the anterior nasal spine and prosthion.
6. *Point B—supramentale:* the deepest midline point on the mandible between infradentale and pogonion.
7. *Frankfort horizontal (cephalometric):* a horizontal plane through left orbitale and tangent to the superior surface of the ear-rod.
8. *Mandibular plane:* a line at the lower border of the mandible tangent to the gonion angle and the profile image of the symphysis.
9. *Facial plane:* a line from nasion to pogonion.

MATERIAL

Two groups of cases were selected from the files of a practice. The first group consisted of all the cases treated over the past six years in which Class II treatment had been completed without the use of intermaxillary elastics. Cervical traction was the only force used in attaining any change in arch relationship. The success of treatment was not considered in any case. There were thirty-two cases in this group (seventeen girls and fifteen boys). The average starting age for the group was 9 years 9 months, and the starting ages ranged from 7 years (one case) to 12 years 6 months. The appliances used with cervical anchorage varied from only two bands on the first permanent molars and a bite plate to a complete edgewise appliance on the upper and lower arches. In four cases teeth were removed. The length of treatment time in this group could not be determined, since some of the patients continued to wear the cervical anchorage at night for an indefinite period of time. Standardized lateral headfilms taken before institution of treatment and either following treatment or some years later were obtained on each case. The interval of time between these films varied from seven months (complete Class II correction) to seven years eight months (failure to obtain film at time of discontinuation of cervical anchorage). The average interval was twenty-four months. The cervical anchorage used consisted of a face-bow type of headgear with an inner bow soldered to an outer bow in the center and ordinary elastic belting around the back of the neck to supply the desired force. The time that the appliance was worn varied from sleeping hours only to constantly except for mealtimes.

The second group selected consisted of thirty-eight cases conventionally treated with a complete edgewise appliance to what was considered a successful conclusion. Intermaxillary elastics were used in these to effect a change in arch relationship. However, many of the patients also wore cervical anchorage part of the time, particularly during the time that Class III intermaxillary elastics were being used to prepare anchorage in the mandibular denture. The average starting age for this group was 12 years 3 months, varying from 16 years to 10 years. There were twenty-three girls and fifteen boys in this group, arbitrarily selected. The interval of time between the headfilms on this group is an indication of the treatment time. The average was twenty-six and one-half months,

varying from sixteen months to thirty-eight months. In this group were twenty-six cases treated with the removal of dental units. Two of the thirty-eight cases were also in the cervical anchorage group, complete major treatment having been instituted because of incomplete results with the headgear.

METHOD

Tracings were made of the before- and after-treatment headfilms of each case in the two groups. The following points and lines were indicated: sella-nasion, Frankfort horizontal, facial plane, mandibular plane, ANS (anterior nasal spine), A point, B point, Po point (pogonion). On the tracing of the after-treatment film the facial plane and Frankfort horizontal were not drawn from landmarks on the tracing but were transferred from the before-treatment tracing at the same angle to sella-nasion. The facial plane on the second tracing was transferred with sella-nasion superimposed at nasion.

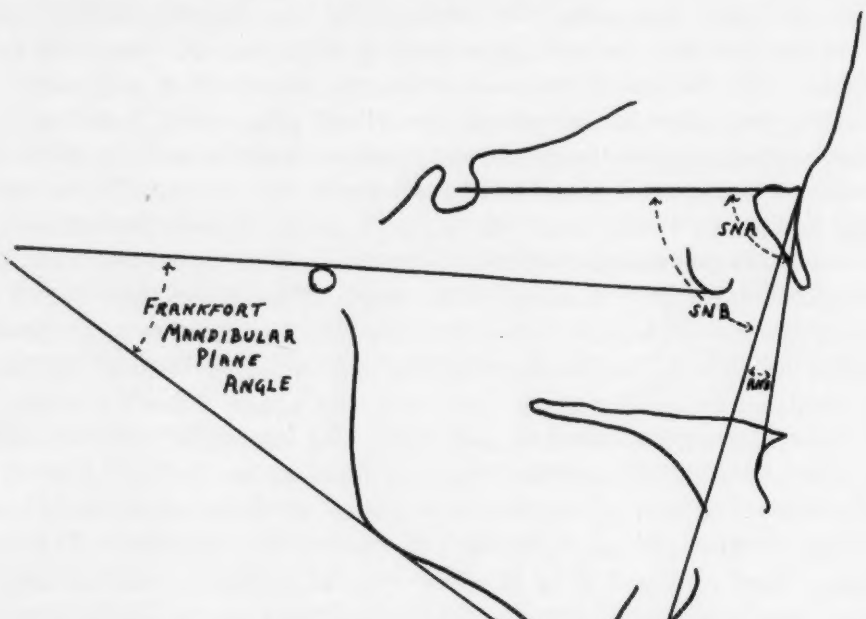

Fig. 1.—Angular measurements recorded.

This method of superpositioning undoubtedly has its faults. We are aware that the angle between the base planes of the cranium may either open or close during growth. However, Poulton,[12] in his study of facial esthetics, demonstrates the relative importance of nasion and the angles derived from it. There is no other point on the facial outline as easily identified and as unaffected by orthodontic intervention as nasion. The rate of anterior growth in the area of nasion will vary in untreated cases from that found in the mandibular and maxillary denture areas. However, when this point is used for superpositioning there is a tendency to minimize the effect of growth on the facial profile and to place the emphasis upon changes effected by treatment.

On each tracing three angular measurements were made: the SNA angle, the SNB angle, and the mandibular plane angle to Frankfort horizontal (Fig. 1). From the SNA and SNB angles was determined the ANB angle. These four angles were recorded, and the differences found in the before- and after-treatment tracings were noted.

Because angular measurements can sometimes be misleading, due to the linear distance between two points varying directly with the length of the arms of a constant angle, linear measurements were also made and compared. There were three of these on the original tracing and four on the subsequent tracing. ANS was projected on a perpendicular to the facial plane, as were points A, B, and Po (on the final tracing) and a tangent to the lower border of the symphysis.

Fig. 2.—Vertical height measurement.

The distance on the facial plane between the intersection of the ANS projection and the tangent to the lower border of the symphysis was recorded in millimeters and referred to as vertical height (Fig. 2). The perpendicular distance of points A, B, and Po (on the after-treatment tracing) from the facial plane was also recorded in millimeters to the nearest tenth (Fig. 3). All measurements anterior to the facial plane were given a plus value, and those posterior to the plane were given a minus value. These measurements were termed horizontal A, horizontal B, and horizontal Po (Fig. 4). The horizontal Po value on the original tracing is always zero. This method of linear horizontal measurement

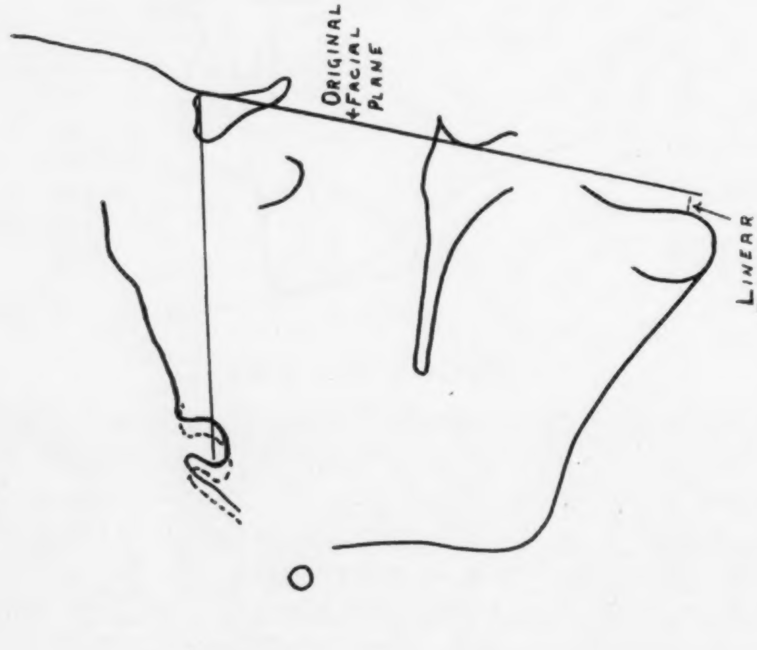

Fig. 3.—Linear pogonion measurement.

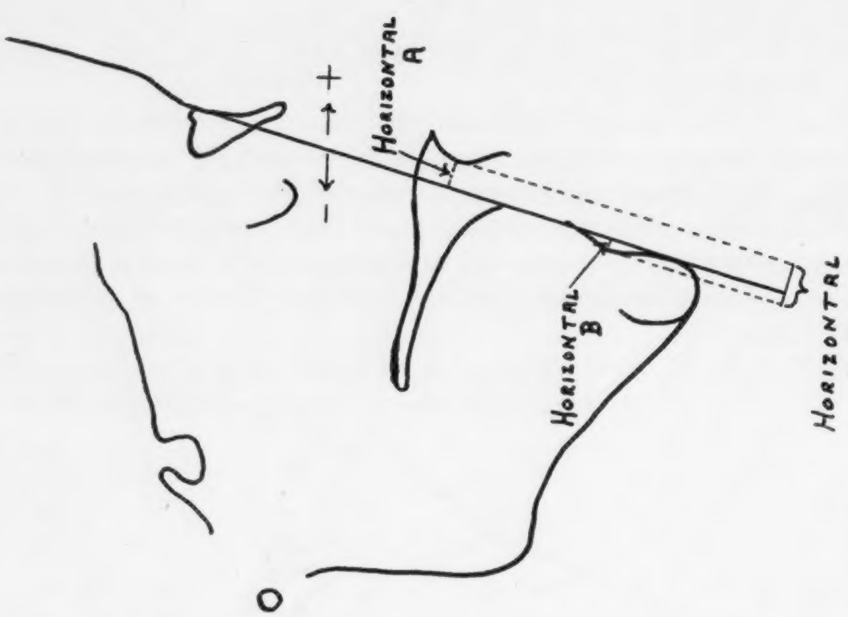

Fig. 4.—Horizontal A and B measurements.

varies somewhat from that used by Lindquist[7] and Lande,[8] who made the measurements parallel to the Frankfort horizontal. There should be only slight variation in the results. If the facial plane measured 90 degrees to Frankfort horizontal, they would be identical, and the variation in the measurements would increase as the facial angle varied from a right angle.

From these measurements can be determined both the angular and the linear changes in A and B points and the change in their relationship to one another. The changes in dental height and the mandibular plane angle can be checked for relationship to the changes found in A, B, and Po points.

FINDINGS

In the interest of brevity the two groups of cases will be referred to hereafter as the CA (cervical anchorage) group and the IME (intermaxillary elastic) group.

The two groups of cases appeared very similar according to the mean of the original measurements, both angular and linear, of points A and B. The mean of the angle ANB was 5 degrees for the CA group and 4.5 degrees for the IME group (Table I). The largest variation in the two groups was in the mean of the ages. The CA group had a mean age of 9 years 9 months, while the IME group had a mean age 12 years 3 months. The linear difference between points A and B, averaged to the nearest tenth of a millimeter, was the same—5.3 mm. for both groups.

TABLE I. STARTING AGES AND ANGULAR POINT A AND B MEASUREMENTS AND THEIR CHANGES DURING TREATMENT

		CERVICAL ANCHORAGE (32 CASES)	INTERMAXILLARY ELASTICS (38 CASES)
Starting age	Mean	9 years 9 months	12 years 3 months
	Range	7 to 12 years	10 to 16 years
	Standard deviation	1.4 years	2.0 years
ANB angle	Mean	5.0°	4.5°
	Range	0 to 10.2°	2.0 to 9.7°
	Standard deviation	2.1°	1.6°
	Mean change	-1.8°	-2.1°
SNA angle	Mean	80.4°	80.1°
	Range	76 to 86°	71.5 to 89.3°
	Standard deviation	1.0°	3.5°
	Mean change	-2.4°	-2.5°
SNB angle	Mean	75.4°	75.7°
	Range	68.5 to 83.5°	68.2 to 83.6°
	Standard deviation	3.0°	2.2°
	Mean change	-0.6°	-0.4°

The explanation for this apparent inconsistency in the relationship of points A and B to one another is interesting. It should make us realize that the occurrence of the same angular measurements on different cases does not necessarily mean that the cases are the same. Angular measurements are comparable only when the points considered are the same distance from the apex of the angle.

In these two groups the older age group has a mean ANB angle 0.5 degree smaller than the younger group, but the horizontal linear distance between the two points is the same in each group. Points A and B are farther from the apex of the angle, nasion, in the older age group. This is borne out by a comparison of the measurements of lower face height in the two groups. The CA group average was 59.3 mm., and the IME group average was 61.3 mm. The 2 mm. difference in the two groups is increased further when the difference in upper face height is included. The greater the facial height, the smaller will be the ANB angle with the same linear A-B horizontal distance. Also, the greater the facial height with the same ANB angle, the greater will be the linear A-B distance. The distance of points A and B from nasion is usually increased due to growth and treatment. Therefore, it is felt that a linear relationship of the points gives a more accurate representation of their relationship to one another.

The means of the angular measurements SNA and SNB were also comparable in the two groups (Table I). The linear measurements of points A and B show that point A was more anterior to the facial plane than point B was posterior in the CA group, and the reverse was true in the IME group (Table II). Thus, on the basis of the original mean measurements in the two groups, the treatment unwittingly followed Holdaway's suggestion that cervical anchorage should be used principally to accomplish changes in point A and intermaxillary elastics should be used to accomplish changes in the mandible, point B. The mean of the Frankfort-mandibular plane angle in the CA group was 28 degrees and in the IME group it was 28.6 degrees.

TABLE II. LINEAR A AND B POINT MEASUREMENTS AND THEIR CHANGES DURING TREATMENT

		CERVICAL ANCHORAGE (32 CASES) (MM.)	INTERMAXILLARY ELASTICS (38 CASES) (MM.)
Linear points A-B	Mean	5.3	5.3
	Range	2.0 to 9.4	1.8 to 10.0
	Standard deviation	2.0	1.8
	Mean change	-0.7	-1.6
Linear point A	Mean	+3.3	+2.9
	Range	-2.5 to +7.0	-0.3 to +8.0
	Standard deviation	1.9	1.9
	Mean change	-2.1	-2.5
Linear point B	Mean	-2.0	-2.5
	Range	-0.6 to -6.0	0.0 to -5.5
	Standard deviation	1.7	1.1
	Mean change	-1.4	-0.9

Changes in the ANB angle were slightly greater in the IME group than in the CA group, according to the means (Table I), although the greatest improvement in any one case was a 6 degree reduction with cervical anchorage.

It is interesting to note that the angle SNB became more severe in both groups. There was a difference of only 0.2 degree in the mean of the change in

the two groups, in spite of the fact that one might expect intermaxillary elastics to cause an increase in the SNB angle.

The mean linear measurements of points A and B show that the variation in the reduction of the A-B distance in the two groups is 0.9 mm., the IME group having had the greatest reduction, namely, 1.6 mm. (Table II). There was considerable variation in response according to the horizontal A-B change. In the CA group nine cases became worse and one showed no change. In the IME group only five cases showed a greater A-B distance following treatment. This is felt to be the result of variation in cooperation or lack of coöperation. A rather wide range of movement was demonstrated in point A in both groups, from plus 0.6 mm. to minus 6.1 mm. in the CA group and from plus 1.5 mm. to minus 6.0 mm. in the IME group. An even wider range was shown in the behavior of point B, from plus 2.2 mm. to minus 5.1 mm. in the CA group and from plus 3.6 mm. to minus 6.3 mm. in the IME group. The behavior of pogonion also varied a great deal in both groups, from plus 4.0 mm. to minus 5.8 mm. in the CA group and from plus 5.7 mm. to minus 5.1 mm. in the IME group. The mean changes in pogonion showed a plus 0.2 mm. change for the IME group and a minus 1.3 mm. change for the CA group (Table III).

TABLE III. TREATMENT CHANGES IN POGONION, MANDIBULAR PLANE ANGLE, AND VERTICAL HEIGHT

		CERVICAL ANCHORAGE (32 CASES)	INTERMAXILLARY ELASTICS (38 CASES)
Pogonion	Mean	-1.3 mm.	+0.2 mm.
	Range	+4.0 to -5.8	+5.7 to -5.1
	Standard deviation	1.7	0.3
Frankfort-mandibular plane angle	Mean	+2.0°	+0.8°
	Range	+7.6 to -1.0	+4.5 to -2.1
	Standard deviation	1.9	1.6
Vertical height	Mean	+4.1 mm.	+4.0 mm.
	Range	+12.5 to -1.0	+8.1 to 0.0
	Standard deviation	2.8	2.0

Because of the wide variations shown in all areas affected by treatment, I decided to select the cases which, during treatment, demonstrated clinically the best cooperation. This cooperation was evident from the results obtained and from other observations as well. Without regard for the measurements obtained, seven such cases were selected from the CA group and nine from the IME group. The means of the basic skeletal measurements of these groups did not vary greatly from those of the original groups. The mean angle for SNA was 81 degrees in the CA group and 79.9 degrees in the IME group. The ANB angle was more severe in the CA group (5.4 degrees) than in the IME group (3.9 degrees). The means of the mandibular plane angle in all four groups varied only from 28 degrees to 28.9 degrees.

Even though the sample is smaller in these select groups, it is felt that a more accurate representation of the variations in the treatment response ac-

complished with the two types of treatment can be shown. In no instance did the findings in the study of the smaller groups reverse the findings in the larger groups. The trends established by the measurements in the original study were made more emphatic in the study of the smaller groups.

TABLE IV. MEAN CHANGES FOUND IN MOST COOPERATIVE PATIENTS OF EACH GROUP RANGES AND STANDARD DEVIATIONS

		CA (7)	IME (9)
Horizontal A-B distance	Mean	-1.2 mm.	-1.8 mm.
	Range	-0.2 to -3.2	+0.6 to -4.6
	Standard deviation	1.1	1.5
Horizontal point A	Mean	-4.6	-3.6
	Range	-2.5 to -6.1	+0.5 to -6.0
	Standard deviation	1.3	2.1
Horizontal point B	Mean	-3.3	-1.9
	Range	-2.0 to -5.1	+1.7 to -5.2
	Standard deviation	1.3	1.5
Horizontal point P	Mean	-3.7	+0.4
	Range	-2.0 to -5.8	+2.0 to -3.6
	Standard deviation	1.5	2.01
ANB angle	Mean	-3.1°	-2.5°
	Range	-1.5 to -4.6	+0.2 to -5.0
	Standard deviation	1.1	1.6
Vertical height	Mean	+4.2	+4.6
	Range	+0.8 to +12.5	+1.7 to +7.1
	Standard deviation	3.8	1.4
Frankfort-mandibular plane angle	Mean	+3.9°	+0.4°
	Range	+2.8 to +5.5	-1.8 to +2.3
	Standard deviation	1.1	1.6

The mean changes indicate that correction in the A-B relationship in both groups, either angular or linear, is accomplished by a change of point A distally relative to facial plane while point B is also moved distally but to a lesser degree than point A (Table IV). The most obvious difference in the behavior of the parts in the two types of treatment is in the mandible, at pogonion and point B. Intermaxillary elastics reduced the degree of distal movement of point B but did not eliminate it. Their effect on pogonion managed to keep it from moving distally, even moving it forward 0.4 mm. according to the mean. Five cases showed distal positioning of pogonion in the IME group, and four showed forward positioning. Vertical change was comparable in both groups. It appears that lower face height is increased in either type of treatment, but the intermaxillary elastics tend to keep the anterior portion of the mandible from swinging back and the mandibular plane angle from increasing as the bite opens and the height increases. The mean changes in point B and the mandibular plane angle in the CA group were quite marked and in an undesirable direction (Table IV.)

Several correlation tests were made to find what connections, if any, there were in the movements of the various parts. There was very little correlation between the amount of movement at point A and the amount at pogonion in either group.

No significant relationship between the increase in vertical height and the change in point A could be established in either group. The relationship between the movements of points A and B was quite positive in both groups at greater than the 1 per cent level, indicating that in either group when point A moved back point B did also.

There appeared to be no correlation between changes in the mandibular plane angle and vertical height in the IME group. In the CA group the correlation was 0.65, just below the necessary figure to be significant at the 1 per cent level. This indicates that in the CA group when the vertical height increases there is a tendency for the size of the Frankfort-mandibular plane angle to increase.

The most positive of the correlation tests concerned the relationship of the changes in mandibular plane angle and point B in the CA group. The figure was 0.80, which is significant at greater than the 1 per cent level. There was no correlation between the behavior of the same two parts in the IME group.

Because of the wide variation in the behavior of point Po in the IME group, an attempt was made to establish some relationship between its behavior and that of any other measurement taken. None could be established in any respect. The original Frankfort-mandibular plane angle was felt to be somewhat indicative of what might be expected in the behavior of pogonion with the use of Class II elastics. It could not be demonstrated. In fact, the case with the largest Frankfort-mandibular plane angle demonstrated the greatest forward change in pogonion, contrary to general expectations.

SUMMARY

Before- and after-treatment headfilms were measured according to certain angular and linear measurements on thirty-two cases treated with cervical anchorage and on thirty-eight cases treated with intermaxillary elastics in addition to cervical anchorage. The variations in the changes occurring in points A and B, pogonion, lower face height, and mandibular plane angle were recorded. According to the mean of the reduction in A-B difference, change in point A distally was responsible for any improvement in either type of treatment. Point B also moved distally in both types of treatment, but to a larger degree in those cases treated with cervical anchorage alone. Except in individual cases, the forward movement of the mandible was not responsible for improvement in A-B distance. The amount of increase in vertical height was similar in the two groups, but the Frankfort-mandibular plane angle opened more in the group handled with cervical anchorage, and point B moved farther distally.

Seven patients from the cervical anchorage group and nine patients from the intermaxillary elastic group were chosen because of their excellent cooperation. The same measurements were compiled on them, and a comparison was made of the changes occurring in certain areas. The findings were similar to those in the larger groups, except that in several instances the variation of the treatment results found in the two types of treatment was considerably more emphatic.

CONCLUSIONS

Class II treatment can effect distal positioning of point A in the profile with the use of either cervical anchorage or intermaxillary elastics.

Class II treatment of either type also effects distal positioning of point B except in a few cases, but to a smaller degree than the change in point A.

The use of intermaxillary elastics tends to nullify this undesirable change in point B.

With few exceptions, the use of intermaxillary elastics did not succeed in making the chin more prominent in the profile.

No explanation for the behavior of the mandible when Class II elastics are used could be found.

In both types of treatment the increase in dental height is similar. When intermaxillary elastics are used, this increase is accomplished without a significant change in mandibular plane angle and with less distal positioning of point B, whereas cervical anchorage with bite plates increases the mandibular plane angle and the distal positioning of point B.

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SIMULTANEOUS OCCURRENCE OF CERTAIN MUSCLE HABITS AND MALOCCLUSION

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IT IS evident that certain forms of abnormal tongue function are closely related to correspondent anomalies in the bite and to the shape of the dental arches, as we know from many cases of open-bite and the typical anomalies resulting from macroglossia.

A number of examinations and observations, most of them made since 1940, seem to show, however, that correlation between muscle habits or functional anomalies and malocclusion is considerably more frequent than formerly assumed.

REVIEW OF LITERATURE

When, in 1944, Tweed[19] stated that Angle's principles of treatment had failed in most cases to achieve the desired result, he based his conclusions on a re-examination of 70 per cent of the patients who had been treated at his dental clinic over a period of six and one-half years. In about 80 per cent he found distinct relapse. He concluded from this that the dental arches cannot be expanded beyond a certain limit determined by the relationship between the corpora of the jawbones. This holds true in both a transverse and a sagittal plane. At the end of the treatment the teeth must have a good static relationship to the subjacent basal bone. At this point, Tweed is in perfect agreement with Lundström.[9] As a concrete aim of treatment, Tweed proposed to bring the incisors of the mandible into such a relationship to their base that their longitudinal axes will form an angle of 90 degrees with the occlusal plane, with a range of variation of $\pm$ 5 degrees, and to adjust the teeth in normal intercuspal relationship to this "anchor." It would thus be possible, he maintained, to achieve the correct static balance and a stable treatment result. However, Tweed's norm of the static balance cannot always be realized. He writes, as early as 1945[20]: "There has never been a question in my mind during the past seven or eight years as to the correct position of the mandibular incisors, but I admit that the greatest difficulties are encountered in so positioning them. But in every instance where there is failure to so position them, something is definitely lost in the balance and harmony of facial esthetics and I fail in my efforts to produce permanence of end results."

Furthermore, serious cases of overjet and deformities in connection with macroglossia illustrate the fact that also in cases where crowding is not a factor, the dental arches may very well stabilize themselves even if the teeth do not have a good static relationship to the subjacent basal bone.

Which forces, then, determine this stability?

A few writers[7, 13-15] have pointed early to the pressure to which the alveolar process and the dental arches are exposed during the function of the jaw musculature. Selmer-Olsen[14] bases his opinion on an examination of Lapp skulls in which the crowding that is so frequent in the mandible must, according to him, be attributed to the functional influence of the buccinator and orbicularis muscles.

In the course of the last ten or fifteen years there has been increasing interest in these problems and considerable research activity has been devoted to them.

Periodical measurements of the mandibular arch width in the canine region of the permanent teeth showed that, as a rule, the latter remains constant or diminishes slightly, whether any orthodontic treatment is employed or not.[5, 16] On the strength of these measurement results, Strang[16] believes it possible to draw the conclusion that the mandibular arch width of the canine region is determined by the individually inherited muscular balance which cannot be altered through treatment. In contrast with this conclusion, stable results of expansion have been reported by other writers, among whom Grude[8] is of the opinion that the use of an "activator" may produce an altered or even greater activity of the tongue, resulting in stability when the dental arches are expanded to a certain degree.

Thorough studies have been made of the function of the tongue, lips, and masseter muscle during deglutition,[11, 12, 17, 18, 21] of the rest position of the tongue,[22] and of the function of the upper respiratory musculature.[1]

A statistical working-up of the results of cephalometric roentgenography[3, 4] led to the conclusion that the alveolar prognathy and the inclination of the incisors with the occlusal plane in both jaws develop in distinct dependence on the sagittal jaw relation, whereas age changes of the latter take place entirely independent of the alveolar and incisal relationships. A correlation study of the age changes in the bite and the facial and craniobasal structure, respectively, showed, moreover, that the regression curves are not correlative. The development of the bite and the dental arches is not merely a result of the growth phenomena in the bones of the skull but is determined, in part, by influences, exclusively and immediately affecting the organ parts in question, whose development normally assumes the form of a compensatory equalization of the sagittal displacements of the jaws which may take place with increasing years. It is Björk's[3, 4] opinion that this compensatory development of the alveolar and dental relationships is primarily due to the formative effect of the musculature. If this function is abnormal, a dysplastic development may take the place of a compensatory development of the alveolar process and the dental arches, resulting in malocclusion.

OBJECT OF THE EXAMINATION

At the dental clinic of the school (Vejlby-Risskov, Denmark), we were of the opinion that a majority of our patients with malocclusion presented a typical dysfunction of the lip musculature, characterized first of all by a distinct

contraction of the mentalis muscle during deglutitions, not connected with mastication or consumption of food. We could rarely observe this condition in patients with normal tooth position and normal occlusion.

With support of our studies in the scientific literature, we felt that it would be of some interest to submit this observation to a closer study. This was carried through in the spring of 1954.

Technique.—We chose for our study a number of children for whom we had at our disposal model material prepared about one year earlier. The examination included all the children of four school classes (a total of 100 children), all about 11 years of age. The children were not informed about the object of the examination. While sitting in the dentist's chair, they were observed discreetly for a few minutes before the normal routine examination was begun. In addition to the relatively few spontaneous deglutitions which took place during the time of observation, we asked the children now and then to swallow saliva or a few drops of water which had been sprayed on the dorsum beforehand. The result of our observation primarily of the function of the mentalis muscle was noted without any previous examination of the bite or of the model material. It should be mentioned, however, that it was naturally inevitable that we should get a rough impression of the bite during the observation. The assistant dentist, Clara Vilain, took part in the examination work. We considered the first cases together and then examined separately the patients who were otherwise normally treated by the other. This course was taken in order to exclude any previous knowledge of the bite conditions.

The results of this inspection were considered in relation to the result of a bite examination, founded partly on our year-old model material and partly on the latest orthodontic diagnosis of the case books which had been made as a matter of routine immediately after the observation of the mentalis function. The criteria employed in orthodontic diagnosis have been reproduced in Table I.

TABLE I. THE CRITERIA EMPLOYED IN THE ORTHODONTIC DIAGNOSIS

Crowding	The difference between total mesiodistal width of teeth and length of alveolar process is 1 mm. or more in one or more regions; the relation is considered separately in each of the four molar regions, four premolar regions, four canine regions, and two incisor regions
Deep maxillary overbite	The shortest distance between upper and lower teeth in molar and premolar regions is 1 mm. or more, when measured with front teeth in incisal contact
Overjet	Longest distance in dorsoventral direction between facial surfaces on upper and lower incisors is 5 mm. or more, when measured in horizontal plane with incisal edge of upper front tooth
Open-bite, cross-bite, mandibular overbite, overlapping molars	Close definition considered unnecessary

Results.—The results of the examination are found in Table II. The figures reveal a very distinct tendency. About 67 per cent of the patients with malocclusion showed a marked mentalis muscle function, whereas the muscle

Table II. Survey of the Result of the Examination

	M +	M + ?	M ÷ ?	M ÷	TOTAL
Crowding or extraction as a consequence of crowding	8	3	1	1	13
Deep maxillary overbite	6	5	1	2	14
Crowding in connection with deep maxillary overbite	5	1			6
Other anomalies	7				7
Crowding in connection with other anomalies	2				2
Number of patients with malocclusion or malposition	28 67%	9	2	3 7%	42
	88%				
Number of patients without malocclusion or malposition	3 5%	9	10	36 62%	58
			80%		
Total	31	18	12	39	100

Column m+ represents patients with definitely established mentalis function; m÷ represents patients with definitely established passive mentalis; ? denotes uncertain judgment. The percentages 67, 7, and 88 are calculated out of the total number of forty-two patients with malocclusion; the percentages 5, 62, and 80 are out of the total number of fifty-eight patients without malocclusion. Of thirty-one patients with active mentalis function twenty-eight, or 90 per cent, have malocclusion. Of thirty-nine patients with passive mentalis muscle, thirty-six, or 92 per cent, have no malocclusion.

remained passive in only 7 per cent. As for those patients who had no malocclusion, the figures were almost reversed; 62 per cent had a passive mentalis muscle and 5 per cent had an active one. Of the thirty-one patients who showed active mentalis function, 90 per cent had malocclusion; conversely, 92 per cent of the thirty-nine patients with a passive mentalis muscle had no malocclusion.

DISCUSSION

It must be admitted, of course, that great caution should be shown in drawing conclusions from an examination founded on a technique as dependent on a subjective observation as the one employed here. The tendency of the figures is so clear, however, that one must be justified in attributing a certain value to them in support of the theory that there is a correlation between the occurrence of the diagnosed malocclusions, or some of these, and the observed dysfunction of the mentalis muscle during the first stages of deglutition. It is not probable, however, that the dysfunction is limited to the musculature which can be immediately observed in the patient's face.

Rix,[11] in 1946, published the results of an examination of ninety-three children aged 7 to 11 years. He found that sixty-one of these children made their deglutition with occluded molars, whereas 31, or about one-third, had separated dental arches during deglutition. He found, moreover, that thirty-six per cent of the children in the first group and 84 per cent in the other had malocclusion. Through electromyographic registration of the masseter and orbicularis muscles, Tulley[17, 18] has later confirmed Rix's observation regarding the typical functional patterns—active masseter and passive orbicularis muscle in most patients, and the reverse pattern in a smaller group—and he adds, "especially if any degree of malocclusion is found."

Through inspection and production of slow-motion pictures, a research group of prosthodontists[22] have analyzed the rest position of the tongue in an unspecified number of patients and found that in about 65 per cent of the cases the tongue was situated in a forward position in the mouth, with the tip resting against the lower incisors and the dorsum curving up against the palate. About 35 per cent held the tongue in a more retracted position with the tip and dorsum in various typical, abnormal positions. They distinguish among four different types. They write, moreover, that in the majority of these patients they found, besides missing teeth and dentures, malocclusions and malformed dental arches and palates.

A comparison of these examination results seems to open up interesting perspectives. We may be confronted with a number of functional habits which play a considerable part in the development of perhaps most of the common malocclusions. At any rate, they seem to occur in remarkably large numbers in such patients. They may be rather complicated in their technique, but they have certain typical features in common. It is probable that they may be combined with abnormal function of groups of muscles other than those mentioned. Moyers'[10] examinations of the temporalis function indicate this.

So far we know very little about this whole complex of abnormal functional habits, but there seems to be good reason for a further and more exact investigation of their nature, operation, origin, and nervous control. Cauhépé[6] has made an interesting contribution to the study of this problem. He considers it an established fact that the functional relationship of the muscles to each other is under the influence of the neuroendocrine system. Since certain movements are individual peculiarities, their repetition is dependent on the temperament and personality which they reveal. Cauhépé has tried to investigate the problem of whether these peculiarities are transmitted by inheritance. In collaboration with Fieux, he has studied the problem in families and found family agreement in 75 per cent of the cases. Out of a family of fifty-two persons, distributed over five generations, thirty-six members showed the same hypertony of the orbicularis muscle and, consequently, alveolar retrusion. Cauhépé is of the opinion that not only the individual anatomic configuration but also the neuromuscular system which affects it is inherited in these cases and must be considered an etiological factor.

These examinations and observations are only the beginnings of a difficult research work to which we may rightly attach the greatest expectations.

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Raadhuspladsen 3.

Orthodontic Profiles

WILLIAM G. LAW

William G. Law was born on Jan. 18, 1876, in Flint, Michigan, the son of William and Ruth (Husted) Law. His death, of influenza, in New York City on Jan. 20, 1920, brought to an end the career of one of the best-qualified orthodontists and one of the most colorful personalities of his time.

His early education was received in the Flint public schools, following which he entered the dental department of the University of Michigan in 1896. He received his D.D.S. degree from that institution in 1899.

In May, 1920, the *Dental Cosmos* published the following résumé of Dr. Law's career.

> Immediately after his graduation he located in Flint, Michigan, where he practiced for two years. He became interested in orthodontics, and having decided to specialize in this branch of dentistry, entered the Angle School of Orthodontia at St. Louis, Missouri. In 1904 he moved to Dresden, Germany, where he associated himself with Dr. William A. Spring, devoting his attention to the specialty of orthodontics. In 1906 he removed to Berlin, Germany, where he continued to practice until the outbreak of the war, when conditions became so disagreeable that he returned to America and located in New York City, where he practiced until the time of his death.
>
> During his residence in Germany, Dr. Law numbered among his patients many of the nobility of Germany, Austria, and Russia. He was a man of strong personal magnetism, which won for him many warm friends. His skill as an orthodontist, combined with his studious habits, inventive mind, and enthusiasm in his work, won for him a foremost position in his profession. His attractive personality and his unusual technical skill, combined with the highest ideals of professionalism, particularly fitted him for pedagogical work, and at the time of his death he was organizing a school for the teaching of the specialty of orthodontics.
>
> Dr. Law was a member of the American Dental Society of Europe, the W. D. Miller Club of Berlin, and one of the founders of the European Orthodontia Society, which he served as president for two years. He was also a member of the Eastern Association of Graduates of the Angle School of Orthodontia, the National Dental Association, the Dental Society of the State of New York, the First District Dental Society of the State of New York, and the American Association of Orthodontists.

The foregoing is the factual summation of the professional life of Dr. Law in its barest outlines, but the details of his life furnish the most fascinating and interesting information. It is quite impossible for me to write this profile for the editor and readers of the American Journal of Orthodontics except in the first person, for it was my privilege to be associated with Dr. Law in Berlin from 1911 until 1914, a period which saw the culmination of a political and social order and the beginning of its downfall. Dr. Law had already become a

dominant figure in European orthodontics when I first met him, and the inspiration and professional training I received from him have been of lifelong value. The man's ambition and enthusiasm for life were unbounded. One of his favorite remarks, often expressed, was that "imagination and enthusiasm are two of the greatest qualities a person can possess," and he exemplified them to a tremendous degree.

One of his greatest passions was music. He had a tenor voice of dramatic power and quality, and he had sung with the glee club at the University of Michigan and carried on his study of voice in Europe. His prime reason for seeking an associate in his practice was to enable him to study voice, languages, and dramatics more seriously, for his greatest ambition was to become an operatic dramatic tenor. One of his closest friends was Putnam Griswold, outstanding bass-baritone of the Metropolitan Opera of New York, who was the guest artist at the Royal Opera of Berlin for several years. I vividly recall the music which flowed from one end of Law's office-apartment where he and Griswold were rehearsing the tenor and baritone roles, respectively, from such operas as *Otello, Rigoletto, Aida,* etc.

There was a considerable number of American dentists in practice in Berlin at this time. American dentists were considered the best qualified in Europe, and they represented the top echelon in this profession. Representative practices contained the names of most of the political, business, and social elite. To be invited to participate in hunting parties at various castles or privately owned shooting preserves was not unusual. American dentists occupied a position of social and professional prominence which would be difficult to understand in America. Because of this, it was necessary to adopt a formality of professional deportment quite foreign to the American way of life but essential and in consonance with the customs of that country. It is easy to recall the monthly meetings of the W. D. Miller Club (organized after the death, in 1907, of Dr. W. D. Miller, who pioneered the work in dental caries) at which every member appeared for dinner in formal evening clothes, although no ladies were ever present. We recall the following members who were regular attendants at the dinners and programs, all from Berlin: Drs. F. D. Abbott, E. D. Barrows, Lawley York, George Watling, George Watson, Charles F. Boedecker, Sr., H. W. C. Boedecker, Charles Boedecker, Jr., A. J. Culver, George Webster, J. Ramey, F. Foerster, George Martin, William Law, Charles Hartley, George Kennedy, and B. G. deVries.

(In examining my personal data written after the outbreak of war in 1914, I found the following item dated Aug. 10, 1914: "This afternoon I sent out notices for a special meeting of the W. D. Miller Dental Club to be held tomorrow. We will probably offer our assistance as Ärzte to the Red Cross Association.")

Dr. Law was intensely interested in teaching orthodontics to his dental confreres not only in Berlin but elsewhere in Europe, and he gave courses of instruction in his offices at In den Zelten, 18 A. It must be remembered that the larger dental offices often comprised an entire apartment, which contained not

only operating rooms but living quarters as well. The last such course given by Dr. Law was given in the summer of 1912. Four men took the course that year: Dr. C. Hartley, Berlin; Dr. Quintero, Lyon, France; Dr. George Hayes, Paris; Dr. Harwood, Brussels, Belgium. Among previous students, I recall Barrows of London, Hipwell of Paris, and Chiavaro and Rome, and there doubtless were many more. It can thus easily be seen that Law's influence was considerable in developing orthodontic thinking in Europe. It fell to my lot to assist in teaching dexterity in soldering techniques and appliance construction at this time. Characteristic of Law's technique was the delicacy and refinement of his appliances, and he constantly implored his students to make them "as little like weapons as possible."

WILLIAM G. LAW

After his return to this country following the outbreak of the war, Dr. Law had the opportunity of engaging in private orthodontic instruction for several months prior to his subsequent re-entry into practice. At this time he spent several months in the office of Dr. Andrew Jackson of Philadelphia, giving the latter instruction in orthodontics. Dr. Jackson, who has become one of our most prominent orthodontists and whose published and clinical contributions to the science and art of orthodontics are outstanding, has personally attributed his original inspiration and zeal to Dr. Law. Indeed, it would have been difficult to withstand the impact of Law's unquestionable enthusiasm and personal magnetism.

Law's overwhelming love for music, combined with his tenor voice of great power, finally led him to a point in his life at which a decision had to be made. He finally concluded that he could never be satisfied or basically content until he had made a supreme effort to satisfy what had become his soul's ambition. It must be remembered that this was the golden era of operatic music and that Berlin was the great musical center of the world. It was the era of Marcella Sembrich; Mary Garden; Geraldine Farrar (the operatic darling of the Kaiser); Battestini, the great baritone; Édouard and Jean de Reszke, the great Polish basso and tenor, respectively; Caruso; Ruffo; and others. One could spend every night attending opera, symphonies, recitals, etc. The season's presentations at the Royal Opera of Wagner's "Ring," composed of the four operas, *Rheingold, Die Walküre, Siegfried,* and *Götterdämmerung,* were gala affairs attended by the Royal Family and conducted by the great Nikisch and the Berlin Philharmonic Orchestra. During these tremendous performances, Law's friend, Putnam Griswold, sang his Wagnerian roles to tumultuous applause. Hardly can a man be censured for succumbing to the lure of operatic stardom, particularly when possessed of a voice of extraordinary natural quality and aided and abetted in his ambitions by one of the era's great operatic singers.

Dr. Law's orthodontic school. *Top:* Drs. Law, Hartley, and Quintero. *Bottom:* Drs. deVries, Harwood, and Hayes.

Thus it was that in 1912 Dr. Law cast the die and determined to embark seriously on the arduous road of voice and operatic training. This decision meant that his orthodontic practice was left in my hands and he, his wife, and their small daughter left for Milan and Rome where his studies were begun. His wife stood loyally by his side during this period of self-examination and ultimate decision, even though it meant the abandonment of an established orthodontic practice and an established way of life in Berlin.

The practice at that time and for the ensuing two years included many children from titled families in Germany and Russia. These were colorful days for a busy orthodontist!

The shadow of war crept in early in 1914. By this time, Law had accepted an engagement to sing tenor roles during August near Venice. He was also considering the acceptance of an engagement as tenor at the Opera in Aix la Chappelle. But the war was to change all this. In the summer of 1913, he had returned to America, where he gave several recitals and also began his overtures to the Metropolitan Opera of New York for acceptance there. He returned to Italy, however, and resumed his studies.

On Aug. 3, 1914, the blow fell! I quote from my personal diary on that date: "One of the greatest wars the world has ever seen is imminent tonight! The gigantic armies of Germany, Austria, Russia, and France are mobilized and guns have already been fired. Berlin is the center of all eyes! Troops have been leaving the city and things are in a turmoil. Even now (11 P.M.) the shouting of the people can be heard . . . the railroads are jammed . . . no mail has entered or left the country for three days . . . foodstuffs have gone up in price and all business is suspended . . . transient Americans are leaving by the hundreds and the excitement is terrible. Tomorrow I must try to get a wire and funds through to Law in Milan. . . . This will ruin my practice. . . . "

Then on Aug. 5, 1914, I wrote: "England declares war on Germany! This makes it dangerous for Americans to be out, for many people mistake us for English . . . one must have his pass with him, for the crowds are excited and act on a moment's impulse." And again on Aug. 10, 1914: "The war is on in earnest . . . many Belgian prisoners have been taken and are on their way to Berlin . . . I am going to stay until I see that, as far as the practice is concerned, it is useless to remain . . . gold money is impossible to obtain . . . checks on Italian banks are no good . . . the only thing I could do was to send Law Italian lira in bank notes through the post office . . . I trust he will receive them."

It was impossible for Law and his family to return to Berlin. Occasional letters between us got through until, on Sept. 13, 1914, came his telegram from Milan via Basel, Switzerland, written in German perforce: "Nehmen Sie unsere Kleider. Wir gehen Amerika—Law." (Bring our clothes. We are going to America.) I quote again from my diary this entry, dated Sept. 13, 1914: "Today I received a telegram from Law in Milan saying they are all going home . . . I shall not risk leaving his silverware here . . . take them all as personal household goods . . . pay the landlord a year's rent . . . incredible that I am leaving Germany."

In the middle of October I managed to secure passage to America on the S. S. "Rotterdam" out of Rotterdam, Holland. By prearrangement, Law met me in Dr. Fred Kemple's office in New York City. It was the end of an era. For Law, it was the end of his dream of a life as a great singer, the frustration of a career which had just commenced. Both of us hoped that the war would soon end and

that we would take up again where we had left off. But that was not to be. Law did return for a short time to clear up what he could and then returned permanently to the United States.

One of my last memories of Bill Law goes back to a meeting of the American Association of Orthodontists at the Edgewater Beach Hotel in Chicago. He was back in orthodontics, perhaps changed somewhat by the experiences of the past few tumultuous years, the significance of which can be truly evaluated only in retrospect. We were walking down Michigan Boulevard in the evening, and suddenly our thinking took a philosophical turn and Law began a discussion of the transmigration of souls, a favorite subject of his. It was the last time I saw him, for shortly thereafter he died of influenza.

William G. Law was a man of phenomenal energy, a zealot, a man satisfied with nothing but the best, a thinker, and a man of intense personal magnetism, enthusiasm, and imagination. He gave much to his beloved profession of orthodontics and left an indelible imprint upon its development during his time.

B. G. deVries.

Reports

REPORT OF THE RESEARCH COMMITTEE, AMERICAN ASSOCIATION OF ORTHODONTISTS, 1958

THE membership of the Committee for 1957 and 1958 was originally composed of the following:

Thomas D. Speidel (Chairman), Minneapolis, Minnesota
J. William Adams, Indianapolis, Indiana (1959)
William B. Downs, Aurora, Illinois (1960)
Herbert I. Margolis, Boston, Massachusetts (1961)
Faustin Weber, Memphis, Tennessee (1962)

We have had three principal objectives: (1) conducting the thirteenth Prize Essay Contest; (2) arranging our eleventh Research Section meeting; and (3) propagating in any way we can the research phase of orthodontics throughout the United States and Canada.

The proper announcements of the year's plans were printed in the *Journal of the American Dental Association* and the AMERICAN JOURNAL OF ORTHODONTICS. Mimeographed forms were sent to all likely sources of papers or abstracts, as well as to those who made requests. Your Committee carefully judged nine essays for the research contest, eight of which were considered of excellent quality. The response with respect to abstracts was equally gratifying and assures us of an excellent sectional program.

The entries for the Prize Essay Contest were received and acknowledged in the manner prescribed in the JOURNAL. The four judging members had no significant differences of opinion on the first-place and second-place theses. The judging on five more was such that they were classified as worthy of some sort of distinguished recognition, and it was decided that the titles and authors should be acknowledged in print in the Research Supplement to the program.

The results of the judging were as follows:

First Award: HEREDITY AND THE CRANIO-FACIAL COMPLEX. A STUDY OF CONCEPTS AND EVALUATION TECHNIQUES. Bertram S. Kraus, D.D.S., PH.D., William J. Wise, D.D.S., and Richard H. Frei, D.D.S., University of Washington.

First Honorable Mention: STANDARDIZED TEMPOROMANDIBULAR JOINT RADIOGRAPHY UTILIZING RADIOGRAPHICALLY PREDETERMINED CONDYLAR INCLINATION. Walter Cooper Sandusky, D.D.S., University of Tennessee.

Distinguished Essays:

Charles J. Burstone, D.D.S.
Herbert D. Davidson, D.D.S.
Albert Reinstein, D.D.S.
Milton Superstine, D.D.S.
George H. Wern, D.D.S.

Provisions have been made for the first-place and first-honorable-mention essays to be presented on the program.

The prize-winning essay and the one chosen for honorable mention are automatically the property of the Association, as announced in the JOURNAL, and were submitted to the editor for disposition. The authors of the distinguished essays will be encouraged to apply for publication in the AMERICAN JOURNAL OF ORTHODONTICS.

The death of our chairman, Dr. Speidel, in December caused no small amount of confusion. President Squires appointed Dr. J. W. Adams as acting chairman and appointed Dr. Richard Reidel to serve out the balance of the fiscal year as the fifth member. Dr. Downs wishes to be dropped from the Committee for reasons of health and has proposed two excellent men for your Committee to consider at its New York meeting. Dr. Squires has been informed of Dr. Downs' situation and wishes.

The Research Committee feels that it should remind the Board that next year's (1959) meeting is in the part of the country where orthodontic research is predominant because of the large number of universities in that region. A larger participation is expected, and provisions as to time and space must be considered in making plans.

Your Research Committee wishes to thank the Board and all officers of the Association for a most helpful attitude in all its functions.

Respectfully submitted,
WILLIAM DOWNS
HERBERT MARGOLIS
FAUSTIN WEBBER
RICHARD REIDEL
J. WILLIAM ADAMS, Chairman.

REPORT OF COMMITTEE ON PUBLIC HEALTH, AMERICAN ASSOCIATION OF ORTHODONTISTS, 1957-1958

YOUR Committee discussed with representatives of the United States Public Health Service the study which the Board of Directors of the American Association of Orthodontists voted in order to achieve the following:

1. The collection of facts about the availability, distribution, and quality of orthodontic services and facilities for children on a nationwide basis.

2. The evaluation and reporting of these facts.
3. The translating of results into action—including the formulation of recommendations based on the findings and the stimulation of interest among members of the profession to correct deficiencies and improve services.

The Committee was advised that the Workshop on Orthodontics to be conducted by the University of Michigan in June, 1958, would afford a splendid opportunity for a basic discussion of the foregoing and that concrete action on this subject should be postponed until after the Michigan Workshop. The chairman on public health of the American Association of Orthodontists has been asked to serve as chairman of the Michigan Workshop section on "Meeting the Demand for Orthodontic Services." It is hoped that this will afford an opportunity to clarify many of the points in the proposed study.

The Committee wishes to thank Dr. Stephen C. Hopkins, Sr., who was kind enough to attend the meetings of the Social Legislation Information Service Voluntary National Organization held at the Department of Health, Education and Welfare, Washington, D. C., Feb. 5 and 6, 1958. Dr. Hopkins thus presented evidence of the interest of the American Association of Orthodontists in child welfare and in social legislation affecting children.

Expenses of the Committee were anonymously defrayed. However, the Committee recommends the continuation of a $500.00 appropriation for 1958 and 1959.

Respectfully submitted,
L. Bodine Higley
Ernest L. Johnson
Herbert K. Cooper
Oren A. Oliver
J. A. Salzmann, Chairman.

In Memoriam

JOHN EDWARD McDERMOTT
1901-1959

JOHN McDERMOTT of Ottumwa, Iowa, died on Feb. 26, 1959, in Chicago, Illinois.

Dr. McDermott, who was born in Dubuque, Iowa, on Oct. 20, 1901, attended Loras Academy and College in Dubuque, and was graduated from the University of Iowa Dental College in 1926. He located in Ottumwa in 1926 and practiced general dentistry there for three years. He then went to Des Moines for an orthodontic preceptorship with Dr. Howard Keeler. He attended the Dewey School of Orthodontics in New York City and Dr. Joe Johnson's course in orthodontics at Columbia University.

He was a member of the Wapello County Dental Society, a life member of the Iowa State Dental Society, and a member of the American Association of Orthodontists and the Central Section of the American Association of Orthodontists. He was also a member of the Denver Summer Seminar for eighteen years, and in 1957 he served as president of this group of forty orthodontists.

A pioneer orthodontist in southern Iowa and northern Missouri for many years, Dr. McDermott had numerous friends in the dental profession throughout the United States and was regarded as a very serious and devoted student of his chosen specialty.

Dr. McDermott is survived by his widow, Mrs. Genevieve Mincks McDermott, and three children, Mrs. Thomas H. Huston of Crawfordsville, Iowa, Mrs. Charles J. Maxwell of Norfolk, Virginia, and Linda McDermott, a student at the University of Iowa.

Department of Orthodontic Abstracts and Reviews

Edited by
DR. J. A. SALZMANN, NEW YORK CITY

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmann, 654 Madison Avenue, New York City.

Thumb- and Finger-Sucking: A Study of 2,650 Infants and Children: By Alfred S. Traisman, M.D., and Howard S. Traisman, M.D. J. Pediatrics **52**: 566-572, May, 1958.

A total of 2,650 patients (1,340 were males and 1,310 females) were studied.

There were 1,208 thumb-suckers, 45.6 per cent of the total group. Of these, 596 were males and 512 were females. The sex distribution is not statistically significant. Seventy-five per cent of the infants who sucked their thumbs began to do so during the first 3 months of life, and the other 25 per cent during the remainder of the first year of life. Thumb-sucking was noted in the newborn and during the neonatal period.

Breast feeding was not found to be a significant factor in the incidence of thumb-sucking.

The average age at which all thumb-sucking stopped was 3.8 years. A few stopped sucking their thumbs during infancy, and some stopped as late as 12 to 15 years of age. Most parents expressed minor concern about this habit during the first 2 to 3 years of age. As the habit persisted past 3 years of age, their anxiety increased.

Pacifiers were not recommended. Of 28 patients who used them, 8 sucked their thumbs.

Malocclusion was diagnosed if there was a protrusion of the anterior upper teeth with a normal molar relationship, or if there was a protrusion of the maxilla with an abnormal molar relationship of the first maxillary molar being one-half tooth forward from the normal position.

Patients were then referred for orthodontic care. If the orthodontist concurred in the findings, the patient was classified as having malocclusion. Malocclusion occurred in 211 patients, or 7.9 per cent of the total group. Of these children, 117, or 55.4 per cent, sucked their thumbs. Of 86 children who wore appliances for malocclusion, 53 had never engaged in the sucking habit and 33 sucked their thumbs. This is not statistically significant.

Of the thumb-suckers, 9.7 per cent developed malocclusion as compared to 6.5 per cent of the nonthumb-suckers. There is a highly significant difference between these two percentages, pointing to a definite effect of thumb-sucking on malocclusion. Though statistically significant, it is obviously very small and of limited extent. However, there is clearly some relationship. One reason for this may be that thumb-sucking beyond a critical age only will result in malocclusion. This is a theoretical possibility, but it is being studied. It is interesting to note that 4 children had mechanical devices placed on their molars to break the sucking habit. This was successful with 1 child and failed

with 3 children. More psychological distress was observed in these latter children after insertion of the dental bar than was seen during the thumb-sucking period.

There was no statistical relationship between psychological problems and thumb-sucking. There was no relationship between colic and thumb-sucking.

Of the 1,208 patients who sucked their thumbs, 976, or 80.8 per cent, still persisted with this habit at 2 years of age. Only 48 infants, 3.9 per cent of those who sucked their thumbs, stopped this habit prior to or at 1 year of age. There were 96 infants 1 year of age at the time of writing who were still sucking their thumbs.

There was no significant difference in the thumb-sucking habit between only children and those with 1 to 4 siblings. There was no significant correlation of this habit among indentical and fraternal twins or between twins and one or more siblings. One cannot say that identical and fraternal twins will have similar thumb-sucking habits.

This is the largest series of patients reported that have been statistically analyzed. Of 2,650 infants and children, 45.6 per cent sucked their thumbs. There was no sex difference, which is contrary to Gesell and Ilg's observation that more boys than girls suck their thumbs. Breast feeding was not a significant factor in the incidence of thumb-sucking.

Feeding time was probably significant in the incidence of thumb-sucking. The majority of persons, 81.6 per cent of the total group, took thirty minutes or less to feed. Of patients in the group of "fast" and "average" feeders, 41.7 to 45.8 per cent sucked their thumbs. Bakwin believes that inadequate sucking time as a cause of thumb-sucking is of minor importance.

Of interest is the fact that there was a significantly higher incidence of thumb-sucking in infants who fed thirty to sixty minutes. Stimulation of the lips and mouth, which are richly supplied with sensory nerve endings, gives a marked feeling of pleasure. Once this satisfying sensation is experienced, there is a desire to have it repeated. Therefore, the more a baby sucks, the more the oral structures are stimulated, and the more gratification is obtained. On this basis, the infant would tend to suck his fingers or thumb because the pleasure he derives has been so implanted and developed. The baby who spends less time in nutritional sucking does not have this pleasure so strongly developed, because there is less oral stimulation, and he may not suck his thumb.

Sears and Wise showed that the oral drive is strengthened by the longer retention of the sucking method of feeding. Therefore, a substitute sucking habit would increase with a decrease in nutritional sucking. The strength of the oral drive, and not frustration in weaning, would determine the incidence of thumb-sucking.

The smallest percentage of those who sucked their thumbs was in the group that took sixty minutes or longer to feed.

The average age at which the thumb-sucking habit stopped spontaneously was 3.8 years. This is longer the the two-year limit that has been mentioned in the literature. Cessation of the habit at this age is compatible with normal tooth and dental arch formation. If malocclusion is caused by the thumb-sucking, the displaced teeth and arch will spontaneously correct themselves after the sucking has ceased, especially after development of the permanent dentition. Ruttle states that "the effect of thumb and finger habits on the molar occlusion merely approaches statistical significance, and does not attain clinical utility."

Of the 211 patients who had malocclusion, 117 sucked their thumbs (9.7 per cent of all thumb-suckers). Of 86 children who wore appliances, only 33 sucked their thumbs. This is not significant. Johnson studied 989 cases

of malocclusion and found 173 patients (17.5 per cent) who sucked their thumbs. In 24.5 per cent of the thumb-suckers, the habit persisted one year or less. Sixty per cent had broken the habit by the end of the third year. When one considers thumb-sucking as a whole, it is a rare cause of dental deformities. The authors are in disagreement with those who maintain that forceful measures should be instituted to stop this habit because of possible dental malformations and psychological problems.

The authors have seen patients, who did not suck their thumbs while using a pacifier, begin this habit when the pacifier was discontinued.

No correlation was found between psychological problems and thumb-sucking. Most authorities are of the opinion that the great majority of thumb-sucking stops spontaneously around 2 or 3 years of age and that forceful cessation of the habit will create neurotic symptoms and personality problems which are more serious than the sucking habit. One definitely cannot predict psychological problems because a child has been or is actively engaged in thumb-sucking.

The problem of thumb-sucking has been overemphasized and parents unduly alarmed. Parents should be informed and reassured about the relative harmlessness of this habit. Occasionally, it may continue because it has been established as a habit even though most of the psychological implications have disappeared.

It would appear incorrect to tell anxious parents that their child will stop this sucking habit by 1 or 2 years of age.

The Design and Construction of Removable Orthodontic Appliances: By C. Philip Adams, B.D.S., F.D.S., D. Orth., Lecturer in Orthodontics, Queen's University, Belfast; Consultant in Orthodontics, Belfast Teaching Hospitals; Formerly Lecturer in Orthodontics, School of Dental Surgery, Liverpool; Lecturer in the Department of Orthodontics, Institute of Dental Surgery, British Postgraduate Medical Federation, University of London. Second Edition. Baltimore, 1957, Williams & Wilkins Company. 118 pages; 173 photographs and diagrams.

In this second edition, as in the first, the author tries to explain the construction of removable appliances and their use. In keeping with the type of appliances discussed, emphasis is placed on tooth movement rather than on the treatment of "types" of malocclusion. The types of appliances widely used in the United States are mentioned in principle only. While the author speaks a great deal about principles, he is concerned mainly with principles of appliance construction rather than with principles of orthodontic therapy.

The first chapter, which is thirteen pages long, discusses the mechanical principles of the twin-wire appliance, the round-arch appliance, and the edgewise appliance. These systems of appliances, widely used in the United States, are discussed in less than three pages of the text. By far the larger portion of the 114 pages of this book is given to the explanation of the design and construction of removable appliances as they are used in England and on the European continent.

While this book is frankly intended as a text on the design and construction of removable appliances, it is likely to leave with the general practitioner of dentistry the thought that the basic principles of treatment of malocclusion are secondary to appliance construction. For those who are currently practicing orthodontics and possess a basic knowledge of orthodontic diagnosis and treatment planning and who wish to employ removable appliances in their practice, this book should prove of value.

A Text-book of Orthodontia: By Robert H. W. Strang, M.D., D.D.S., and Will M. Thompson, Jr., D.D.S. Fourth edition, Philadelphia, 1958, Lea & Febiger. 880 pages. Price, $20.00.

A new edition of Dr. Robert H. W. Strang's *Text-book of Orthodontia* is always awaited with interest, especially by those specialists using the edgewise arch wire mechanism in the treatment of malocclusion of the teeth.

In this, the fourth edition, Dr. Strang has been aided by Dr. Will M. Thompson, Jr. They have carefully revised many parts of the book, bringing the text into line with recent advances in the specialty.

A new chapter on clinical cephalometrics by Dr. Thompson has been added, including the latest developments in case analysis.

The many illustrations and line drawings are excellent, the text is well written, and the subject matter is carefully organized and clearly presented. The book will be of great value to teachers and students as well as to the practicing orthodontist.

Glenn H. Whitson.

The Age Factor in Orthodontics: By G. G. T. Fletcher. *D. Practitioner* **9**: 31-40, October, 1958.

Prolonged appliance therapy is due not so much to patients' failure to cooperate or to any intrinsic difficulty of their orthodontic problems as to errors of judgment on the part of the orthodontist himself.

The records of 200 completed orthodontic cases at the Eastman Dental Hospital were examined. These patients were unselected, and the only qualification was that they had completed a full course of treatment, not limited in its objectives, and had concluded with a reasonably high standard of result. They had been attended by a large number of different orthodontists using a wide variety of orthodontic mechanical apparatus. The only common ground on which all the patients stood was that their diagnosis was based on the same philosophy.

One hundred of these patients commenced their active orthodontic appliance treatment in the adult dentition and 100 began it in the mixed dentition stages.

Interest centered on the periods in which appliances were being actively worn. Thus, if a patient had a central incisor moved over the bite at the age of 8, wore an appliance for a month for this purpose, and then discarded all apparatus until a final phase of active treatment at the age of 12, lasting one year, this would be considered an active period of one year one month, not five years. Pre- and posttreatment observation time was excluded, as was that of postoperative retention.

The majority of the patients whose treatment times have been used were under the care of first- and second-year postgraduate orthodontic students working under supervision and other conditions necessary to a teaching organization but not necessarily conducive to operative quickness. The fully trained and experienced operator working in his own private office should, therefore, produce similar or better results in still shorter time.

If an orthodontic treatment can be carried out in the adult dentition, the chances of a very much shorter duration of treatment seem much improved over cases commenced in the mixed dentition.

Some will argue that not all correction can be left to the adult dentition stage but that some must be embarked upon earlier in order that a patient's

condition may be rendered treatable. Alternatively, it may be argued that the ultimate result of treatment would be greatly improved by such early interference.

Those whose treatment was begun between the ages of 7 and 11 years show a duration of around four years; those commencing treatment between 11 and 13 years of age have a little over two years' active treatment, and from 14 upward there is an expectation of the shortest period of all.

These patients of 14 and over presented for treatment with the adult occlusion already present. The choice of early treatment did not exist and yet not only were these cases completed in the shortest time but the results shown on the record models appeared to be better than those of earlier age groups.

In the author's opinion, orthodontic conditions are potentially treatable or untreatable, and failure to obtain early treatment seldom, if ever, alters this potentiality.

How many times does failure to obtain early forms of treatment lead to more difficult mechanical tooth movement later? Among the forty patients over the age of 14 years who form the third collective group, there should be a few whose treatment took well above the average length of time, due to increased difficulty that might have been eliminated by earlier treatment. In fact, the longest individual period of these forty cases was three years two months, well inside the average for the mixed dentition. This was the only one of these cases to exceed three years; of the remaining thirty-nine, twenty-eight completed the required tooth movements in under two years. Although the number of patients involved in this group is comparatively small, the indication is that very few become so complex that they suffer in terms of time as a result of being left to the permanent dentition stage. However, total chairside time for adult treatments may be slightly increased.

It has been said that the time to start orthodontic mechanical treatment is in the very late mixed dentition stage. By so doing, some local tooth movement can be carried out while eruption of the remaining permanent teeth takes place concurrently. Out of the 200 patients investigated, 127 commenced treatment during the final change-over period from mixed to permanent dentition, which is an indication of the popularity of the belief that this is the best time to start treatment.

Even at this popular age for treatment commencement, it is those patients who have reached the adult dentition whose treatment time is shortened while those who have not quite reached that stage still flounder.

Treatment commenced in the mixed dentition will, as a rule, turn out to be a protracted affair; this is equally true even of cases commenced in the very late mixed dentition period. Only with the eruption of the full permanent dentition does treatment time shorten to reasonable proportions.

From the practical mechanical aspect of treatment in the mixed dentition, early loss, root resorption, and exfoliation of the deciduous buccal teeth reduce the anchorage available to negligible proportions and consequently slow down the rate and quantity of tooth movement that can be undertaken safely at any given time.

The arrival of the full permanent dentition provides the orthodontist with firmer and more extensive anchorage against which multiple tooth movements can be carried out, at the same time reducing the risk of inadvertent movement of the wrong teeth by reciprocal action.

An analysis of the 100 permanent-dentition treatments, from the point of view of the duration of active treatment in relation to the type of appliance

used, shows that the treatments carried out completely by multiband appliances are shorter than those resolved by other methods. The six-month difference between the time taken by multiband as against simpler techniques would have been smaller, were it not for the temptation to save work and the objection by some patients to wearing bands on their teeth. This has led in some instances to the hopeful use of a simple apparatus to attempt to carry out tooth movements for which it is mechanically inefficient or incapable.

Appliances of the multiband type are particularly suitable for effecting such movements as rotations, changes of axial inclination, bodily root movement, and extensive space closure where these occur in multiple fashion in the same malocclusion. Simpler apparatus is applicable to those treatments demanding predominantly tilting actions.

Even if it is assumed that muscular influence remains constant, there is the fact that the dental arches vary quantitatively and qualitatively during the change from the mixed to the permanent dentition and might react differently to the same environment. If these or any other potential sources of early error could give rise, individually or collectively to a misjudgment of the final adult arch capacity by 2 to 3 mm., this could lead on occasion to the need for complete reassessment and retreatment or the acceptance of a substandard result.

Since the practical orthodontist must work in millimeters and degrees, diagnosis and treatment planning supporting commencement of treatment must be completely accurate to be of more than largely academic interest.

There is a real danger of building up treatment on an early false assumption which, in turn, falsifies subsequent action. The truth may not be discovered until much valuable time and energy have been spent and the mocking sight of relapse pronounces the necessity to retreat from the beginning on different lines.

Treatment planning becomes surer and more objective when the full adult dentition has been present long enough to have overcome its initial instability and when all the factors in the final adult dental balance have exerted their respective influences on one another and the effect of this can be seen and judged on its clinical merits.

The occasions when early interference is justified by necessity are comparatively rare. Too frequently early treatment, particularly in patients of 9 years and under, is a system of punctuated progress from one stage to the next, providing a lengthy substitute for the more objective, continuous, and concentrated adult route.

Study of these 200 case records and their statistical analysis has suggested strongly not only that is early interference frequently superfluous but also that at all stages of the mixed dentition there is an increased liability to error.

Variability of Tooth Formation in Man: By S. M. Garn, A. B. Lewis, and D. L. Polacheck. *Science* **128**: 1510, Dec. 12, 1958.

Data on the timing of tooth formation are of potential value in a wide variety of applications, ranging from the estimation of age in skeletal remains and accident victims to the investigation of dental development in precocious puberty and endocrinopathies.

Using serial oblique-jaw roentgenograms of a total of 255 white Ohio-born participants in the Fels Longitudinal Studies, the authors determined the time of occurrence of three stages of formation in five mandibular teeth on an individual basis, after reference to each succeeding and each previous x-ray in the series.

As shown in Table I, the present fifth to ninety-fifth percentile ranges greatly exceed in magnitude the "ranges" given previously for each of fourteen tooth stage comparisons. On the average, the present ranges and those published by Kronfeld differ by a factor of 3.

There are several possible explanations for the fact that variability of tooth formation as determined in this study is so much greater than has been accepted hitherto. These possibilities include the inevitable differences between histologic and radiographic findings, differences in the measure of variability employed, and differences in the populations sampled. The most likely explanation lies in the extremely small samples previously investigated. The earlier values are based on a total of twenty-five to thirty cadavers, most of them from children who were debilitated at the time of death and many of whom were developmentally abnormal. For most of the developmental stages of the teeth compared here, the ranges previously given could not have been based on more than two persons. In contrast, the present data, though not intended for use as norms, are based on from 32 to 196 examples of each stage of each tooth considered.

TABLE I. VARIABILITY OF MANDIBULAR TOOTH FORMATION (IN MONTHS) AS FOUND IN THE PRESENT STUDY AND AS COMMONLY GIVEN

TOOTH	THIS STUDY			KRONFELD "RANGE"*
	NO.	PERCENTILE 5TH	PERCENTILE 95TH	
Beginning calcification				
$\overline{P_1}$	164	19	36	21- 24
$\overline{P_2}$	179	32	56	27- 30
$\overline{M_1}$	157	1	3	birth
$\overline{M_2}$	196	34	58	30- 36
$\overline{M_3}$	135	90	131	96-120
Crown completion—root formation				
$\overline{P_1}$	172	72	97	60- 72
$\overline{P_2}$	166	80	112	72- 84
$\overline{M_1}$	175	37	58	30- 36
$\overline{M_2}$	177	88	122	84- 96
$\overline{M_3}$	53	143	205	144-192
Root completion—apical closure				
$\overline{P_1}$	40	134	168	144-156
$\overline{P_2}$	32	145	184	156-168
$\overline{M_1}$	87	105	139	108-120
$\overline{M_2}$	37	154	211	168-180

*Identical ranges given in Kronfeld and Wilkins. Values given by Schour and Massler and Arey were obtained by combining maxillary and mandibular "ranges." $\overline{P}$, premolar; $\overline{M}$, molar.

Radiation Hazards: By Clinton C. Powell, M.D., *Am. J. Pub. Health.* **49**: 1-9, January, 1959.

Even though a majority of radiographic examinations may not yield any positive findings of significance, this does not mean that they were unnecessary. Improved technique is a much more fruitful area and one which can produce the desired results in terms of reduction of radiation exposure while at the same time actually increasing the diagnostic yield.

The most important single factor in reducing radiation exposure to the population is adequate and proper limitation of the size of the primary beam. X-rays from the direct beam which strike the body outside the area to be visualized on the film not only create needless exposure but also decrease the quality of examination. The direct beam should be strictly limited by the use of cones or diaphragms to an area no larger than that which is to be visualized on the film. The importance of proper diaphragming or coning cannot be overemphasized in the diagnostic examination of children, where at least the reproductive organs and often the whole body may be easily involved in the radiation field unless proper safeguards are observed.

The provision of filtration in the radiation beam will absorb the soft radiation which does not penetrate the body sufficiently to be of diagnostic value. This will result in a significantly reduced exposure of the part being examined and will yield a film of superior diagnostic quality. With adults, 2 or 3 mm. of aluminum filtration in the primary beam will often not even require adjustment of the radiographic technique; yet, it will substantially reduce the exposure. Lesser amounts of filtration may occasionally be needed on thin parts of the body or on children.

There are, in addition, a series of more technical details, such as optimum kilovoltage, faster films and developers, extended processing times, and the like, which can contribute materially toward reducing patient x-ray exposure. A most important factor may be to assure that films of satisfactory quality are obtained with as few repeat examinations as possible.

When all the currently available factors are considered together, it is often possible to reduce the radiation exposure on a given examination to only 1 or 2 per cent of the previous exposure level.

The Effects of Radiation on the Development of the Jaw: By Shunsuke Ohta. *J. Osaka Univ. D. Soc.* **3**: 123-142, 1958.

The Atomic Bomb Casualty Commission-Hiroshima reported that retarded development attributable to the atomic bomb has been found in Hiroshima's exposed children. This investigation was conducted to study the effects of atomic bomb radiation on the growth of the jawbones. The effects have been studied by comparing the exposed children with control children of the same age.

The investigation was conducted on 1,309 children (659 exposed and 650 nonexposed). Exposed and control children aged 8, 10, 12, 14, 16, and 18 years of age, who visited the Atomic Bomb Casualty Commission Clinics in Hiroshima for the Pediatrics Program during the period from January to September, 1953, were examined. These children had been exposed between the ages of less than 1 year to 10 years.

Of the twenty-two measurements taken, three measurements—tragion-tragion, zygion-zygion and A-N-Pog, B-N-Pog—show a statistically significant difference between the exposed and the control children. When the difference in the mean of a measurement between the two groups is less than 1 mm. and the standard deviation is 4 to 5 mm., the statistical difference cannot be considered a biologic one. But, if it is assumed that there is a biologic difference, the difference can be explained as follows: The means of the absolute value of the measurements, compared with that of the control children, showed that the facial width of the exposed children seems to be narrower with protrusion of the alveolar base of the lower jaw and advance of the *mentum*. From this fact and the fact that no differences were noted between the area of the eye-ear planes, and the fact that no differences were noted in the measurements

of orbitale-gnathion, which indicates the vertical development of the jaw, it may be assumed that the forward development of the face of the exposed children, that is, the phenotype of the facial curves of the exposed children as compared with that of the control children, may have been lengthened. Therefore, it may be concluded that the characteristic features of the jaws of exposed children, as compared with those of control children, may be their narrowing in width and forward protrusion. The problem of whether this change was due to the direct or indirect effects of the atomic bomb is complex, and when nutrition and other special biologic stimulations are considered the solution becomes more difficult. However, the results of the statistical investigation do reveal a difference between the exposed and the control children.

News and Notes

Research Grant Awarded American Association of Orthodontists

A research grant of $9,835.00 has been awarded to the American Association of Orthodontists by the National Institutes of Health of the United States Public Health Service. The grant is for a "Research Workshop in Roentgenographic Cephalometrics" which will be held by the Special Committee on Roentgenographic Cephalometrics of the American Association of Orthodontists on July 7, 8, and 9, 1959, at the Bolton Fund Headquarters, Western Reserve University, Cleveland, Ohio.

Application for the grant was made by Dr. J. A. Salzmann, Chairman of the Special Committee on Roentgenographic Cephalometrics, who is specified in the award as Director of the project. Others on the application, including members of the Committee and consultants, are Drs. B. Holly Broadbent, L. B. Higley, Allan G. Brodie, Wendell L. Wylie, Robert E. Moyers, Herbert Margolis, William B. Downs, W. M. Krogman, and T. M. Graber.

It gives me pleasure to make this announcement which brings official recognition to our Association from the United States Public Health Service.

C. Edward Martinek, President
American Association of Orthodontists.

Great Lakes Society of Orthodontists

The next meeting of the Great Lakes Society of Orthodontists will be held Nov. 29 to Dec. 2, 1959, in Cleveland, Ohio.

Northeastern Society of Orthodontists

The annual meeting of the Northeastern Society of Orthodontists was held at the Hotel Biltmore in New York City on March 8, 9, and 10, 1959.

A near-record total of about 525 members and guests were registered for the meeting, which opened with a cocktail party on Sunday night.

The scientific sessions commenced at 9:15 A.M. Monday, when President Bedell called the meeting to order, and continued through Tuesday afternoon. The following papers were presented:

A Consideration of Anterior Tooth Discrepancies and of Overbite in Good Occlusion and Malocclusion. Brainerd F. Swain.

Serial Extraction in Orthodontics: Indications and Limitations, B. F. Dewel.

The Medical Care of Adolescents. J. Roswell Gallagher.

Neuromuscular Mechanisms Involved in Mandibular Movement and Posture. Nicholas A. DiSalvo.

Atypical Treatment Procedures. Ralph E. Braden.

The Gingival Attachment and the Orthodontic Band. Henry M. Goldman.

Early Diagnosis and Treatment of Arch Length Deficiencies. B. F. Dewel.

Case Reports—Class II, Division 1. Ashley E. Howes, Ralph E. Braden, Walter H. Mosmann, and Bercu Fischer.

The following officers were elected:

President:	Wilbur J. Prezzano
President-Elect:	Henry C. Beebe
Vice-President:	Irving Grenadier
Secretary-Treasurer:	David Mossberg
Editor and Sectional Editor:	Joseph D. Eby
Assistant Editor:	Brainerd F. Swain
Historian:	Leuman M. Waugh
Board of Censors	
For one-year unexpired term:	J. A. Salzmann
For three-year terms:	Clifford G. Glaser
	Walter G. Bedell
*Director to A.A.O.**	Norman L. Hillyer
*Alternate Director to A.A.O.**	Richard A. Lowy

Denver Summer Seminar

The twenty-second annual Denver Summer Meeting for the Advancement of Orthodontic Practice and Research will be held Aug. 2 to 7, 1959, at Writer's Manor, 1730 South Colorado Blvd., Denver, Colorado. The following will be on the program: S. D. Gore, New Orleans, Louisiana; Harry Sicher, Chicago, Illinois; and Nathan Kohn, Jr., St. Louis, Missouri.

Oklahoma-Kansas Orthodontic Meeting

The Oklahoma-Kansas Orthodontic Meeting will be held Sunday and Monday, June 7 and 8, 1959, at Western Hills Lodge, Sequoyah State Park, Wagoner, Oklahoma. The program follows.

Sunday, June 7

6 P.M. Social Hour.

7 P.M. Dinner with wives. (There will be planned activities for the children.)

8 P.M. Cephalometrics. William M. Lathrop, Norton, Kansas.

Monday, June 8

9 A.M. Cephalometrics. L. Levern Merrifield, Ponca City, Oklahoma.

Howard H. Dukes, Secretary
Kansas State Orthodontic Society

Kansas State Orthodontic Society

The new officers of the Kansas State Orthodontic Society are as follows:

President, Leo A. Rogers, Hutchinson, Kansas
President-Elect, Ray Woodworth, Topeka, Kansas
Secretary-Treasurer, Howard Dukes, Kansas City, Kansas.

*For two-year terms.

Orthodontic Graduate Programs Offered Under University Sponsorship*

SCHOOLS OFFERING PROGRAM	LENGTH (MONTHS)	DEGREE GRANTED	NO. ACCEPTED	DATE PROGRAM BEGINS	SUBMIT APPLICATION BY	FACULTY MEMBER RESPONSIBLE
Alabama	24 or more	M.S.	2	September	January	Dr. Boyd W. Tarpley
Southern California	16	M.S., M.S.D.	10	February	November	Dr. Spencer R. Atkinson
Illinois	18†	M.S.	10	September	January	Dr. Allan G. Brodie
Loyola (Chicago)	24	M.S.	4	June	March	Dr. Joseph Jarabak
Northwestern	15 33	M.S.D., M.S. Ph.D.	12	September	September	Dr. John R. Thompson
Indiana	18	M.S.D., M.S.	Several	September	Any time	Dr. J. W. Adams
Tufts	16	M.S., M.S.D.	10			Dr. Herbert I. Margolis
Michigan	21	M.S.	7	September	February	Dr. Robert E. Moyers
Minnesota	21	M.S.D.	5	September	May	Dr. S. R. Steadman
St. Louis	24	M.S.	7	September	June	Dr. Kenneth C. Marshall
Washington (St. Louis)	21	M.S.	6	September	March	Dr. Earl E. Shepard
Kansas City	18	M.S.D.	8	July	March	Dr. Francis M. Calmes Dr. V. Bowles
Nebraska	17	M.S.D.	3	September	April	Dr. Sam Weinstein
Eastman Dispensary	24	M.S.	5	September	January	Dr. J. Daniel Subtelny
North Carolina	20	M.S.	5	June	March	Dr. L. B. Higley
Ohio	18‡	M.S.	—	October	December	Dr. Robert E. Wade
Pennsylvania	12 24	M.Sc.(Dent) D.Sc.(Dent)	10	§	Previous July	Dr. Paul V. Reid
Pittsburgh	24 48	M.S. Ph.D.	5	September	February	Dr. H. C. Metz Dr. Joseph J. Bonello
Tennessee	18	M.S.	10	January July	6 mos. in advance	Dr. Faustin N. Weber
Univ. of Wash. (Seattle)	18	M.S.	10	September	January	Dr. Alton W. Moore

*Courtesy of the Council on Dental Education of the American Dental Association.

†First nine months in postgraduate division.

‡Includes six months of postgraduate training.

§Basic science course, which is a prerequisite for admission to this program, begins in October and is of sixteen months' duration.

House Approves Keogh-Simpson Bill in Voice Vote

The Keogh-Simpson Bill (H.R. 10), which would permit tax deferrals on a portion of income for retirement programs for self-employed persons, was passed overwhelmingly by voice vote March 16 in the House of Representatives under an order for suspension of rules. There was an unusually good turnout for the voting. The bill was sent to the Senate. The A.D.A. Council on Legislation had sent telegrams to secretaries of component societies and other individuals suggesting that they communicate with their congressmen to urge them to be present for the voting. For the Senate, Minority Leader Dirksen (R., Ill.) served notice March 3 that he was opposed to the measure. After a conference of Republican leaders with President Eisenhower, Senator Dirksen said the bill would cost $365 million annually in federal revenues and "open a $3 billion hole in federal revenues over a period of years." At the last session of Congress, it was Senator Dirksen who introduced a similar bill and was one of the few committed supporters of the proposed legislation in the Senate. Opposition to the measure was voiced also by Secretary of the Treasury Anderson. In a letter of March 14 to Rep. Byrnes (R., Wis.), chairman of the House Republican Policy Committee, Secretary Anderson contended that under the measure "about 80 per cent of the total tax relief would go to the self-employed with incomes over $10,000," and added: "We do not believe that selective tax relief of this magnitude should be permitted at a time when general tax relief is not possible."

Three Named to Defense Department Dental Advisory Committee*

Dr. Paul H. Jeserich, of Ann Arbor, Michigan, president-elect of the American Dental Association, has been named a representative of the A.D.A. on the Dental Advisory Committee of the Department of Defense. Others newly named to the Committee are Dr. Thomas F. Powers, of Plainfield, New Jersey, chairman of the Council on Federal Dental Services, and Dr. Clemens V. Rault, of Washington, D. C., dean of the School of Dentistry, Georgetown University. The Committee, which is headed by Dr. Thomas P. Fox, of Philadelphia, also includes the chiefs of the three armed forces dental services. In addition to his appointment to the Dental Advisory Committee, Dr. Jeserich was named to the Dependents' Medical Care Advisory Committee on the Defense Department.

Dr. Fairbank Named Secretary of A.D.A. Section

Dr. Leigh C. Fairbank, 1726 Eye St., N.W., Washington, D. C., has been appointed secretary of the Section on Orthodontics of the American Dental Association.

American Dental Association

"A Century of Health Service" will be evaluated in a special centennial issue of *The Journal of the American Dental Association* to be published in June. Many of the nation's leading dental authorities have contributed to the 256-page number commemorating the 100th anniversary of the Association.

There will be a three-part section on the history of the Association, a five-part section on developments in dental science, a three-part section on dental education, and various individual articles, including a look at "Dentistry of Tomorrow."

Included will be an array of congratulatory messages, ranging from those from President Eisenhower, the United States Congress, and Secretary Flemming of the Department of Health, Education and Welfare to the presidents of such groups as the American

*From the A.D.A. *News Letter*, March 16, 1959.

Medical Association, American Hospital Association, American Bar Association, World Health Organization, American Public Health Association, American Pharmaceutical Association, National Dairy Council, and American Public Welfare Association.

The publication will also contain a number of rare historical pictures indicating high lights in organized dentistry's growth as well as pictures showing the wide range of activities in which the profession is engaged today.

"In carrying out its mission as the representative of the nation's dentists, the American Dental Association has amassed a distinguished record of service to the public," Dr. Lon W. Morrey, editor of the *Journal*, said.

"The contents of this special centennial issue will serve both to perpetuate organized dentistry's record of achievements as a permanent record and to offer a significant reference work. Our goal has been to provide a fitting tribute to a major element in the nation's health services."

Senate Unanimously Adopts Centennial Resolution Commending A.D.A.; Association Lauded for "Selflessness and Devotion" to Nation's Health*

In tribute to the centennial year of the American Dental Association, the Senate last week unanimously adopted a resolution commending the dentists of the United States for having "achieved world-wide recognition for their contributions to improved health." In a report urging the adoption of the resolution, the Senate Committee on Labor and Public Welfare, headed by Sen. Hill (D., Ala.), praised the A.D.A. for "the selflessness and devotion with which the American Dental Association has repeatedly sponsored programs which have contributed greatly to the dental health of the people of America and, indeed, of peoples throughout the world." The committee noted that in legislation concerned with health matters, it had "invariably found" representatives of the Association to be concerned that proposed laws "would be so designed as to best advance the health of our nation." Seventy-nine senators, an unusually high number, joined with Sen. Murray (D., Mont.) in sponsoring the resolution. Following is the text of the centennial resolution:

> Whereas the American Dental Association, representing more than 85 per centum of the nation's dentists, has for one hundred years been effective in advancing the art and science of dentistry and extending their benefits to more and more people; and
>
> Whereas the dental health care available to the people of the United States is superior to any in the world; and
>
> Whereas the high level of dental education in the United States has enabled American dentists to prevent as well as treat and control dental disease; and
>
> Whereas the dental profession of the United States has sponsored scientific research which has produced many outstanding results designed to improve the health, comfort, and appearance of all citizens; and
>
> Whereas further research will be enhanced by construction of the new building for the National Institute of Dental Research at Bethesda, Maryland, which was vigorously supported in the Congress by the American Dental Association; and
>
> Whereas the dentists of the United States have achieved worldwide recognition for their contributions to improved health; and
>
> Whereas the American Dental Association is observing its centennial during the year 1959, the actual date of organization being August 3, 1859: Therefore be it

*From the A.D.A. *News Letter*, March 2, 1959.

Resolved, that the felicitations and best wishes of the Congress of the United States are hereby cordially extended to the American Dental Association on its many and varied contributions to the health of the people and upon the occasion of the one hundredth anniversary of the founding of the Association.

American Association of Dental Schools

Dr. Robert W. McNulty, Dean of the School of Dentistry, University of Southern California (Los Angeles), was elected President of the American Association of Dental Schools at its thirty-sixth annual session held in San Francisco in March. Other officers elected by the Association were Dr. Raymond J. Nagle, Dean, College of Dentistry, New York University (New York City), President-Elect, and Dr. Lester W. Burket, Dean, Thomas W. Evans Museum and Dental Institute, School of Dentistry, University of Pennsylvania (Philadelphia), Vice-President. Dr. George W. Teuscher, Dean of Northwestern University Dental School (Chicago), and Dr. Harry Lyons, Dean, School of Dentistry, Medical College of Virginia (Richmond), were elected to continuing membership on the Executive Council of the Association, and Dr. O. M. Dresen, Dean, School of Dentistry, Marquette University (Milwaukee), and Dr. Maurice J. Hickey, University of Washington School of Dentistry (Seattle), were named to new positions on the Executive Council, the managing body of the Association. Mr. Reginald H. Sullens (Chicago) was appointed Secretary-Treasurer of the Association, and Dr. Marion W. McCrea, Acting Dean, School of Dentistry, University of Minnesota (Minneapolis), was named to the office of Editor.

Dr. John E. Buhler, Dean, Emory University School of Dentistry (Atlanta), and Dr. Francis J. Conley, Professor, School of Dentistry, University of Southern California (Los Angeles), were nominated to membership of the American Dental Association Council on Dental Education and Council of the National Board of Dental Examiners, respectively.

The Association voted approval of a complete revision of its Constitution and Bylaws, which are now patterned substantially after the organizational structure of the American Dental Association. Each of the forty-eight members of the Association, representing the approved dental schools in the United States and Canada, elects two members to the House of Delegates, the governing body of the Association. At the first meeting of the new House of Delegates, it was voted to seek incorporation of the Association, probably in the state of Illinois. The central office of the Association is located in Chicago, Illinois, at 840 North Lake Shore Drive.

Among actions voted by the representatives of dental education in the United States and Canada was a resolution acclaiming the 100th anniversary of the American Dental Association. The American Association of Dental Schools also went on record urging the Congress of the United States to continue and increase the support of all aspects of dental research activity under the program of the National Institute of Dental Research.

Announcement was made of a $5,000.00 grant to the Association by the Fund for Dental Education for the purpose of supporting projects and conferences planned by the Association during 1959.

Fourteen conference sessions devoted to various segments of the dental curriculum were attended by more than 500 dental educators from schools throughout the United States and Canada.

The 1960 annual session of the Association will be held in Chicago, Illinois, on March 20-23. Information regarding the program for the 1960 meeting can be obtained from the Association's central office in Chicago.

American Association of Dental Schools and Fund for Dental Education

The American Association of Dental Schools and the Fund for Dental Education opened their offices at 840 North Lake Shore Dr., Suite 526, Chicago, Illinois, on Feb. 1, 1959.

Design for A.D.A. Centennial Stamp Announced by Post Office—Mayor Wagner of New York Extends Welcome for 100th Session*

The design for the four-cent postage stamp to be issued in honor of the Centennial Year of the A.D.A. has been announced by Postmaster General Arthur E. Summerfield. The stamp, appropriately, will be issued at special ceremonies at the opening meeting, on September 14, of the Centennial Session of the Association in New York City. An initial printing of 120 million has been authorized. Prospective visitors to the five-day session are urged to make applications now for hotel reservations. "While some of the hotels already are booked solid, ample accommodations still are available," Dr. William A. Fennelly, of New York, chairman of the general committee on local arrangements, said. "I am sure your attendance at this historic 100th anniversary observance will leave you with a memory of a genuinely enjoyable occasion."

A message of welcome has also been extended by Mayor Robert Wagner of New York. In a message to Dr. Percy T. Phillips, of New York, president of the A.D.A., Mayor Wagner said: "It gives me a great deal of pleasure to extend warm greetings to the members of the American Dental Association on the occasion of its 100th anniversary. Our city is very pleased to have the honor of having the American Dental Association hold this most significant meeting here. With all best wishes for continued success."

Applications for hotel accommodations should be made on the official form appearing in *The Journal of the American Dental Association* and mailed to the A.D.A. Housing Bureau, P.O. Box 5440, Chicago 7.

Dr. W. R. Alstadt Praised in "Congressional Record"

The March 16 issue of the *Congressional Record* reprints a lengthy newspaper interview with Dr. William R. Alstadt of Little Rock, Arkansas, past-president of the American Dental Association. The story appeared originally in the *Arkansas Democrat*. The newspaper account was inserted by Congressman Gathings of Arkansas, who praised the dental leader for his contribution to a "better public understanding" of dentistry and dental health, particularly with respect to water fluoridation and misleading claims for "miracle" dentifrices.

Columbia's Dental and Medical Schools Will Be Separate Units

Columbia University's School of Dental and Oral Surgery, which has been a part of the Faculty of Medicine since 1945, will be given independent status as the Faculty of Dentistry, starting July 1. Dental dean will be Dr. Gilbert P. Smith.

This step is in line with recommendations made in 1957 by the president's committee on the educational future of the University. The report also recommended increased emphasis on postgraduate teaching, with primary stress on research in dental science and teacher training for dental schools. Improvement of the physical plant was considered a necessity.

Dr. Grayson Kirk, president of Columbia, says this action of the trustees recognizes "the increasingly important role of dentistry in the health sciences." He said, "The present close relationship of the medical and dental faculties with respect to instruction of dental students will continue."

*From the *A.D.A. News Letter*, April 1, 1959.

Death of Alfred Rogers

Just before the JOURNAL went to press, your editor received the sad news that Dr. Alfred Rogers of Boston, Massachusetts, died on Sunday, April 5, 1959. A complete obituary will appear in a later issue.

Notes of Interest

Dr. Z. Bernard Lloyd announces the association of Dr. Henry J. Heim in the practice of orthodontics and the removal of his office to 4701 Wisconsin Ave., N. W., Washington, D. C.

Dr. George V. Newman announces the removal of his Newark office to Medical Tower, 31 Lincoln Park, Newark, New Jersey, practice limited to orthodontics.

Dr. Harold E. Sippel formally announces the association of his son, Dr. Robert C. Sippel, in the exclusive practice of orthodontics at 32 Linwood Ave., Buffalo, New York.

Dr. George Tunstall announces the opening of his office at D12 Tyler Bldg., Presidential Gardens, Alexandria, Virginia.

Forthcoming meetings of the American Association of Orthodontists:
1960—Shoreham Hotel, Washington, D. C., April 24 to 28.
1961—Denver, Colorado.
1962—Los Angeles, California.
1963—Americana Hotel, Miami Beach, Florida.

OFFICERS OF ORTHODONTIC SOCIETIES

The AMERICAN JOURNAL OF ORTHODONTICS is the official publication of the American Association of Orthodontists and its component societies. The Editorial Board of the JOURNAL is composed of a representative of each of the component societies.

American Association of Orthodontists
(Next meeting May 4-7, 1959, Detroit)

President, C. Edward Martinek - - - - - - - - - - - - Fisher Bldg., Detroit, Mich.
President-Elect, George M. Anderson - - - - - - - - 3700 N. Charles St., Baltimore, Md.
Vice-President, Ernest N. Bach - - - - - - - - - - Professional Bldg., Toledo, Ohio
Secretary, Earl E. Shepard - - - - - - - - - - - - - - 8230 Forsyth, St. Louis, Mo.

Central Section of the American Association of Orthodontists
(Next meeting Sept. 28 and 29, 1959, Chicago)

President, John R. Thompson - - - - - - - - - - 55 E. Washington St., Chicago, Ill.
Secretary-Treasurer, William F. Ford - - - - - - - 575 Lincoln Ave., Winnetka, Ill.
Director, Elmer F. Bay - - - - - - - - - - - - 216 Medical Arts Bldg., Omaha, Neb.

Great Lakes Society of Orthodontists
(Next meeting Nov. 29-Dec. 2, 1959, Cleveland)

President, Richard C. Beatty - - - - - - - - - - - - 1140 Hanna Bldg., Cleveland, Ohio
Secretary, D. C. Miller - - - - - - - - - - - - - - 40 South Third St., Columbus, Ohio
Director, Harlow L. Shehan - - - - - - - 601 Jackson City Bank Bldg., Jackson, Mich.

Middle Atlantic Society of Orthodontists
(Next meeting Oct. 4-6, 1959, Washington)

President, Stephen C. Hopkins, Sr. - - - - - 1746 K St., N. W., Washington, D. C.
Secretary-Treasurer, Charles S. Jonas - - - - - - Mayfair Apts., Atlantic City, N. J.
Director, B. Edwin Erikson - - - - - 3726 Connecticut Ave., N. W., Washington, D. C.

Northeastern Society of Orthodontists

President, Wilbur J. Prezzano - - - - - - - - - - Medical Centre, White Plains, N. Y.
Secretary-Treasurer, David Mossberg - - - - - - 36 Central Park S., New York, N. Y.
Director, Norman L. Hillyer - - - - - - - - 230 Hilton Ave., Hempstead, L. I., N. Y.

Pacific Coast Society of Orthodontists

President, Richard Railsback - - - - - - - - - - 1333 Grand Ave., Piedmont, Calif.
Secretary-Treasurer, Warren Kitchen - - - - - - 2037 Irving St., San Francisco, Calif.
Director, Richard Railsback - - - - - - - - - - - - 1333 Grand Ave., Piedmont, Calif.

Rocky Mountain Society of Orthodontists
(Next meeting Sept. 13-16, 1959, Aspen, Colo.)

President, Howard L. Wilson - - - - - - - - - - 1107 Republic Bldg., Denver, Colo.
Secretary-Treasurer, E. H. Mullinax - - - 209 Lakewood Medical Center, Lakewood, Colo.
Director, Ernest T. Klein - - - - - - - - - - - - 632 Republic Bldg., Denver, Colo.

Southern Society of Orthodontists
(Next meeting Oct. 11-14, 1959, Atlanta)

President, H. Harvey Payne - - - - - - - - - - - - 60 Fifth St., N.E., Atlanta, Ga.
Secretary-Treasurer, William H. Oliver - - - - - - - 1915 Broadway, Nashville, Tenn.
Director, Boyd W. Tarpley - - - - - - - - 2118 Fourteenth Ave., S., Birmingham, Ala.

Southwestern Society of Orthodontists
(Next meeting Oct. 4-7, 1959, Houston)

President, Marcus Murphey - - - - - - - - - - - - 2017 West Gray, Houston, Texas
Secretary-Treasurer, Harold S. Born - - - - - - 908 S. Johnstone, Bartlesville, Okla.
Director, Nathan Gaston - - - - - - - - - - - - - - 701 Walnut St., Monroe, La.

American Board of Orthodontics

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Vice-President, L. Bodine Higley - - - - University of North Carolina, Chapel Hill, N. C.
Secretary, Wendell L. Wylie - - - - - - University of California School of Dentistry,
The Medical Center, San Francisco, Calif.
Treasurer, Jacob A. Salzmann - - - - - - - - - 654 Madison Ave., New York, N. Y.
Director, B. F. Dewel - - - - - - - - - - - - - - - 708 Church St., Evanston, Ill.
Director, Frank P. Bowyer - - - - - - - - - 608 Medical Arts Bldg., Knoxville, Tenn.
Director, Paul V. Reid - - - - - - - - - 1501 Medical Arts Bldg., Philadelphia, Pa.

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